TETRA TECH

MEMO

To:	Ms. Mary Beth Marks – On Scene Coordinator/COR, Gallatin National Forest
Cc:	Sonny Thornborrow
From:	Jim Maus, Tetra Tech
Date:	February 12, 2016
Subject:	Beal Barren Pond Removal (Project# 114-560420) - Final

INTRODUCTION

During the 2015 field season the facility known as the Barren Pond was further investigated as a source of cyanide along the north perimeter of the leach pad. This work was originally authorized under contract AG-0343-B-12-0002; work order number AG-0343-K-13-0003 Task Number 2, dated August 15, 2013. Site field activities for 2013 included obtaining biosolid bucket samples for further testing.

2014 ACTIVITIES

During the spring of 2014, a landfarm pilot test was conducted at Tetra Tech's office in Helena, Montana. Methods and results of this landfarm test are discussed in a technical memorandum to Mary Beth Marks, from Jim Maus dated January 15, 2015.

On June 3rd, 2014, Tetra Tech began dewatering activities in anticipation of pond removal and investigation. Dewatering incorporated the use of a 3-inch diesel powered pump that was then upgraded to a 4-inch pump. Discharge was routed to the native hillside east of the pond. This discharge encountered several melting snow drifts generating additional runoff. Surface flow ultimately proceeded to the vicinity of sample location known as SPR-T (spring –T). Rapid addition of moisture to this area ultimately generated a small landslide that flowed down slope to the German Gulch access road. Upon discovery of the landslide, Tetra Tech routed water to the runoff ditch along the north perimeter of the leach pad which conveyed water to the west. Dewatering continued for approximately two weeks. The bid package for pond removal was dated July 1, 2014, and earthwork contractor bids were received no later than July 30, 2014. Contractor bids were significantly greater than initial engineer's estimates resulting in a rebid process and modification to Tetra Tech's contract to allow the earthwork contractor to be directly contracted to the USFS. Due to the rebidding and contract revision process, construction activities were postponed until the 2015 construction season. Ultimately, the contract was awarded to M&P Excavating (M&P) of Deer Lodge, Montana. Tetra Tech's scope under the above work order was modified to consist of engineering support, environmental monitoring, and continuous air monitoring.

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2015 ACTIVITIES

On June 15, 2015, M&P began mobilizing equipment to the site. Pond dewatering began on June 17, 2015. Discharge water was directed to the runoff ditch along the north perimeter of the leach pad for conveyance to the west. Tetra Tech made site visits on June 22, 24, and 29 at the request of USFS personnel to evaluate numerous buried pipes encountered during the installation of water treatment influent and reject lines. Tetra Tech conducted continuous air monitoring of the excavation during each site visit using daily calibrated MSA-Altair 5X multi-gas meters. Meters were setup to monitor carbon monoxide (CO), lower explosive limit (LEL), oxygen (O2), hydrogen cyanide (HCN), and hydrogen sulfide (H2S). Air monitoring results are presented in **Table 1** below. Plan and profile of buried utilities encountered (**Figures 1 through 3**) is attached along with a representative photo log of activities.

The majority of infrastructure encountered in trenching near the northwest corner of the pond were later removed (**Figure 1**). Three buried lines encountered near the southwest corner of the pond were left in place after tapping them with a ¼ inch drill hole encountered either water or vacuum within. The northern most line bubbled water through the tap hole to a fountain height of approximately six inches. Flow from the tap hole subsided within 20 minutes. The middle line drew air in and thus exhibited a slight vacuum when tapped. The southernmost line also drew air in and thus exhibited a slight vacuum when tapped. However, shortly after tapping the southernmost line, water began flowing from the connection point of the RO influent line at the southeast corner of the pond. Based on these observations, pressure gauges were installed on these three lines for further evaluation while the water treatment system was operating. During water treatment operations (active pumping from Sump -1), the northernmost line exhibited zero pressure and zero vacuum yet slowly discharged water. The middle line exhibited a slight vacuum (negative pressure) of - 0.073 pounds per square inch (psi). The southernmost line exhibited a positive pressure of approximately 60 psi. These three lines were further excavated to trace later in the season and the results are depicted on **Figure 1**.

The trench excavated north and west of the Barren Pond for the installation of water treatment piping encountered bedrock and unexpected groundwater. Visual observations of the trench side walls indicated a primary and secondary fracture system within the rock. The primary fractures paralleled bedding planes and trended north-south. Secondary fractures were generally perpendicular to primary fractures and trended east-west. Visual observations further suggest that the primary fractures were sealed shut by a precipitate and the groundwater appeared to be moving through the secondary fracture system.

On July 7, 2015, removal of the Barren Pond had proceeded to the point in which the contractor was ready to begin excavation of biosolid materials from the bottom of the pond. Upon beginning excavation, air monitoring equipment alarms triggered for the presence of HCN gas. Two separate monitors (one in the cab of the excavator and one approximately 50 feet downwind) were in service at the time of the alarms. While the excavator was working surface materials, these meters were reporting relatively consistent HCN concentrations of 2 to 6 parts per million (ppm). During the alarm period the excavator was attempting to remove material from depth, at which time the meters reported HCN at concentrations of 10 to 12 ppm consistently, which exceeded the Occupational Safety and Health Administration (OSHA) permissible exposure limit (PEL) of 10 ppm. Excavation work was halted and a partial shutdown notice was issued to the contractor. Prior to receiving the shutdown notice Tetra Tech obtained two 5-gallon bucket samples of biosolid material from depth for further testing.

During the following week Tetra Tech discovered that meters may have potentially reported several non-cyanide compounds as HCN. Upon questioning, the meter's manufacturer identified potential interference from the following compounds: hydrogen sulfide (H2S), sulfur dioxide, sulfur compounds, ammonia (NH3), chlorine (Cl2), nitric oxide (NO), organic silicones, silicate compounds, and lead compounds. Due to the similarity in electrochemical signatures, the meter manufacturer indicated there is no way to mitigate these potential interferences. To address this question, Tetra Tech contacted Energy Laboratories and Eurofins-Lancaster Laboratories to inquire about sampling and analysis methods to identify the compounds present in biosolid gasses. Neither laboratory could provide a practical method of collecting or analyzing a gaseous sample for the

compounds likely to provide meter interference. Further investigation identified colorimetric tubes manufactured by Drager Safety AG & Co. (Drager) as a potential solution. This technology relies on a chemical reaction to occur within a disposable glass tube which results in a color change of a compound-specific media to identify the presence and concentration of the specific compound. Unfortunately, Drager tubes also have limitations due to cross interference. On July 15, 2015, Tetra Tech submitted a proposal to obtain Drager tubes for various compounds likely present. Verbal authorization to proceed was received the following day.

On July 17, 2015, Drager tubes were obtained and Tetra Tech conducted headspace testing of the partially filled bucket samples retrieved on July 7th. Results of cross interference testing were transmitted to the USFS on July 17 via email with a more detailed explanation to follow in a technical memo to Mary Beth Marks, from Jim Maus dated July 21, 2015.

Investigation into interferences with the MSA-Altair 5X multigas meter showed that, while interference cannot be completely eliminated as a cause, the high readings can at least be partially attributed to hydrogen cyanide. Additionally, hydrogen sulfide was likely present as a result of bacterial decay of organics with sulfur dioxide present as a byproduct of hydrogen sulfide volatilization. Due to the likely presence of cyanide and hydrogen sulfide in the Barren Pond biosolids, an investigation into possible treatment methods was conducted. The preferred treatment option that was chosen was the application of ferrous sulfate. Ferrous sulfate was selected due to its availability, low health risk, ease of application, cost effectiveness, and ability to address both cyanide by stabilization and hydrogen sulfide by destruction.

A change order was prepared and submitted on July 31, 2015. The change order incorporated numerous additions and eliminations to the original construction specifications. These changes included the application of ferrous sulfate, altered the handling of the biosolids from a dig and haul process to a slurry transport process, eliminated the originally specified clay additive, added a nonionic polymer to flocculate the slurry, conversion of the originally specified drying pad to a dewatering pad, and eliminated of the originally specified temporary repository.

On September 8, 2015 the contractor mobilized to the site to begin preparation of the dewatering pad. On September 14, Tetra Tech began continuous air monitoring of pond removal activities. On September 16 and 17 several attempts to operate and trouble shoot the slurry system were made. Complications arose with the use of the polymer not flocculating the slurry adequately. Ultimately, on September 17 a decision was made by the USFS representative, with Tetra Tech and M&P Excavating consensus, to discontinue use of the slurry method and revert to dig and haul methods.

During the period of September 18 to September 25, 2015, Tetra Tech provided continuous air monitoring oversight of biosolid removal activities. The final load of biosolid material was removed on September 25. The general removal approach consisted of the following steps:

1) Mix four 40-lb bags of granular ferrous sulfate with 500-gallons of water;
2) Spray ferrous sulfate solution onto biosolids area to be excavated;
3) Mix ferrous sulfate into biosolids using excavator generating a thick slurry and apply additional ferrous sulfate as needed per air monitoring indications while mixing;
4) Mix pond sidewall clay with biosolids at an approximately 1:1 ratio using excavator to adequately thicken for hauling;
5) Load thickened biosolids into a dump truck and haul to drying pad converted to temporary repository; and,
6) Repeat steps 1 through 5 in another area of biosolids.

Continuous air monitoring included use of two MSA-Altair 5X multi-gas meters which were calibrated daily. Meters were setup to monitor CO, LEL, O2, HCN, and H2S. Meters were rented from Argus Hazco Inc. One gas monitor was placed in the cab of the excavator while the second was hand held within 50 feet downwind of the active excavation. Since wind direction within the pond depression could be significantly different and variable compared

to prevailing winds, a portable “wind sock” was devised to determine wind direction. This “wind sock” consisted of a long handle shovel with a short length of surveyors flagging tied to the end of the handle. The shovel could be positioned at a safe accessible location adjacent to the active excavation and driven into the pond sub-clay liner or biosolids. The hand held monitor was then positioned accordingly down wind and repositioned as necessary. All monitored parameters remained at background levels during intrusive activities with the exception of HCN.

Air monitoring results for HCN are presented in the following table.

Table 1 - HCN Air Monitoring Results

	Downwind Monitor			Excavator Cab Monitor		
Date	Peak	STEL	TWA	Peak	STEL	TWA
6/22/2015	0.0	0.0	0.0	0.0	0.0	0.0
6/24/2015	0.0	0.0	0.0	0.0	0.0	0.0
6/29/2015	0.0	0.0	0.0	0.0	0.0	0.0
7/6/2015	0.0	0.0	0.0	0.0	0.0	0.0
7/7/2015	12	0.5	0.0	11.5	0.5	0.0
9/14/2015	0.0	0.0	0.0	0.0	0.0	0.0
9/15//2015	0.0	0.0	0.0	0.0	0.0	0.0
9/16/2015	0.0	0.0	0.0	0.0	0.0	0.0
9/18/2015	30	0.0	0.0	4.5	0.0	0.0
9/21/2015	38.5	0.0	0.0	1.5	0.0	0.0
9/22/2015	26.5	0.5	0.0	2.0	0.0	0.0
9/23/2015	18.5	1.5	0.0	6.0	0.0	0.0
9/24/2015	34.0	3.5	0.5	3.5	0.0	0.0
9/25/2015	11.5	0.0	0.0	2.0	0.0	0.0
9/28/2015	0.0	0.0	0.0	0.0	0.0	0.0
9/29/2015	1.5	0.0	0.0	0.0	0.0	0.0
9/30/2015	0.0	0.0	0.0	0.0	0.0	0.0
10/1/2015	0.0	0.0	0.0	0.0	0.0	0.0

Notes: Peak – maximum instantaneous reading for workers shift.
STEL- short term exposure limit based on 15 minute running average.
TWA – Time weighted average to up to a 10-hour work shift.
OSHA PEL = 10 ppm; NIOSH STEL=4.7 ppm; IDLH (Immediately dangerous to life and health) = 50 ppm

Air monitoring equipment in the excavator cab rarely registered HCN concentrations above 5 ppm during mixing and removal activities. Downwind air monitoring equipment frequently registered HCN concentrations greater than 10 ppm during the application and mixing of the ferrous sulfate solution. These elevated concentrations were usually very short-lived or instantaneous spikes. A degree of interpretation of meter readings became necessary to judge whether additional ferrous sulfate was necessary. No biosolids were hauled until air monitoring of the treated batch of biosolids was consistently below 4 ppm HCN while agitating the mixture. Biosolid thickness in the pond bottom averaged five feet with up to six feet in some locations along the north side. Biosolid material was a consistent, very fine-grained clay like material, grey to black in color, with a semi-liquid flow-able consistency. The blackest material usually exhibited the highest HCN readings and the strongest, foulest odor.

During the period of September 25 through September 30, 2015, Tetra Tech conducted continuous air monitoring oversight while the pond polyvinyl chloride (PVC) liner, pond sidewall clay, and pond bottom clay were removed. Two layers of PVC liner material were encountered throughout the pond. Three layers were encountered in the corners. Between layers of PVC were two ¾-inch schedule 40 PVC pipes that extended from approximately the center of the pond floor. One pipe was traced up the east sidewall and one up the west sidewall. These pipes were presumed to have been used as part of a leak detection system. During liner removal, several feet of two separate seams of the uppermost PVC layer in the northwest corner of the pond bottom did not appear to have been welded, or had been sealed improperly. Water was present between PVC layers in this area. Upon removal of the PVC liner, Tetra Tech observed several locations of the pond sidewalls and floor where the underlying clay was stained a bluish-green or black color. Surface staining generally did not penetrate the clay more than ½-inch.

A few locations of surface staining that were probed exhibited staining penetration up to 12 inches. During removal of pond sidewall clay, the pond corners often exhibited black staining beneath an unstained surface. All staining beneath the PVC liner was found at elevations at or below the top elevation of biosolids within the liner, with the exception of surficial staining on the west wall. Stained clay was stripped and placed in the temporary repository with the biosolids. Unstained sidewall clay and pond bottom clay were stripped separately and each stockpiled separately outside of the temporary repository. A geotextile fabric was encountered between the clay and native soils. Pond sidewall clay was generally found to be approximately 2 to 2.5 feet thick. Bottom clay was generally found to be 2.5 to 3 feet thick. Black staining of native soils on the pond bottom was common. Sub soil staining generally did not penetrate greater than four inches. Tetra Tech collected two, five-point composite samples of stained native subsoils and one water sample from a shallow pool that formed in a depression for laboratory analysis. Results are presented in Table 2 below. Stained subsoils were then removed to the extent feasible and stockpiled in the temporary repository. Despite encountering groundwater in shallow trenching north and west of the Barren Pond, no groundwater seepage from pond sidewalls was observed during removal activities. Groundwater was only encountered at the very bottom of the pond.

Table 2 - Lab results of sub- soils and water

Sample ID	Date	Total CN (mg/kg)	WAD CN (mg/kg)	Free CN (mg/kg)	Total CN (mg/L)	WAD CN (mg/L)	Free CN (mg/L)	Total Recoverable Selenium (mg/L)
Barren Pond Bottom Stain E	09/30/2015	44	<0.5	<4.0	--	--	--	--
Barren Pond Bottom Stain NW	09/30/2015	<0.5	<0.5	<4.0	--	--	--	--
Barren Pond Bottom GW	09/30/2015	--	--	--	35.8	0.026	<0.20	0.037

Note: Mg/kg = milligrams per kilogram, mg/L = milligrams per liter, WAD = weak acid dissociable

Review of these results suggest the two PVC linings and the 2 to 3 feet of clay leaked sufficiently to allow cyanide into the underlying soils and groundwater, and that the biosolids were in fact a source of cyanide to the surrounding area.

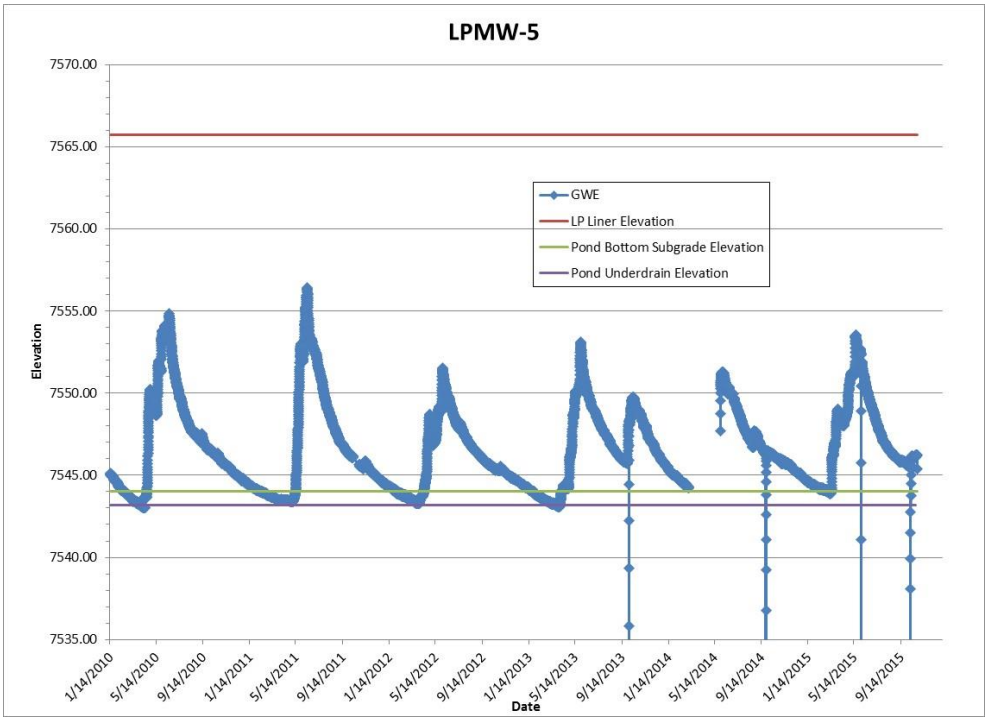
On September 30, Tetra Tech and USFS observed the exploration and investigation of the pond underdrain reportedly constructed beneath the Barren Pond. In general, the underdrain exposed beneath the pond was found to be constructed as described in the December 14, 1988, construction report with two exceptions as described below.

1. The orientation of the drain was found to be more southeasterly than south and exited the southeast corner of the pond.
2. Upon excavation, the drain pipe was found to have been damaged during construction. The 4-inch high density polyethylene (HDPE) pipe was found severed approximately five feet downgradient of the perforated section. The perforated side of the severed pipe was found to be bent approximately 45 degrees to the east. Additionally, projection of the perforated section was at an elevation approximately 8 to 10-inches higher than the corresponding downgradient mate. Upon exposing the downgradient mate to the damaged pipe, Tetra Tech confirmed that this pipe did report to the northeast corner of the BCD pond and was the same pipe outlet being sampled as location BCD-Barren. The origins of a second pipe outlet at the northeast corner of the BCD pond remain unknown.
3. The drain pipe was found without bedding with native rocky trench material as backfill.

The pond under drain intake was fitted with a four inch perforated riser pipe approximately one foot in length and a depression excavated around the intake area to facilitate drainage of the area over winter.

During removal activities, groundwater elevations in monitoring well LPMW-5 (located between the leach pad and Barren Pond) did not appear to be influenced by removal actions and were similar to previous data. This data is presented in the following graph. Note, the subgrade elevation of the pond bottom was surveyed on October 28, 2015, to be approximately 7,544 feet above mean sea level, which is well below previously recorded groundwater elevations.

Figure 4. LPMW-5 Groundwater Elevations



Enclosed:

- Photo log
- Figures 1 through 3 Infrastructure Encountered
- Field notes
- Lab Report

Photo Log

BARREN POND REMOVAL
BEAL MTN MINE, MONTANA
TETRA TECH PROJECT 114-560420.200

PHOTOGRAPH 1 Barren Pond 2006.

PHOTOGRAPH 2 June 3, 2014 Initial dewatering with discharge to the east.

PHOTOGRAPH 3 June 6, 2014 small landslide.

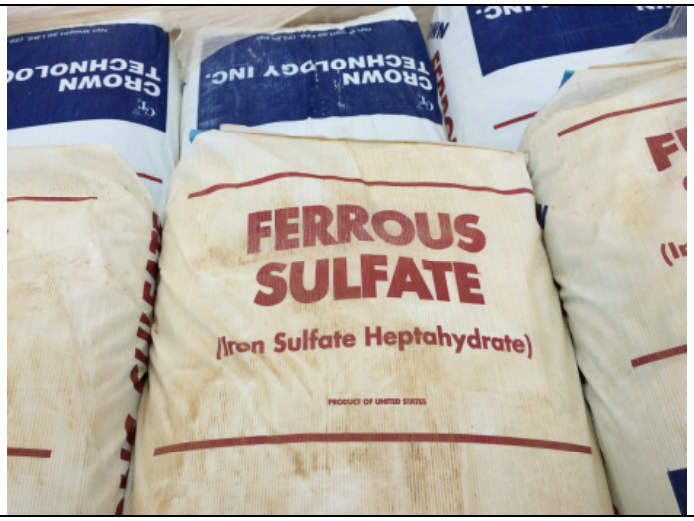
PHOTOGRAPH 4 June 6, 2014 small landslide

PHOTOGRAPH 5 June 12, 2014 dewatering discharge to leach pad runoff ditch.

PHOTOGRAPH 6 June 22, 2015 Surveying buried infrastructure. Note groundwater in trench.

BARREN POND REMOVAL
BEAL MTN MINE, MONTANA
TETRA TECH PROJECT 114-560420.200

PHOTOGRAPH 7 June 22, 2015 Trench for water treatment influent and reject pipes west of pond. Note bedrock and groundwater.



PHOTOGRAPH 8 Sept 14, 2015 Ferrous Sulfate used to stabilize HCN.

PHOTOGRAPH 9 Ferrous Sulfate mixing tanks.

PHOTOGRAPH 10 Sept 14, 2015 Applying initial dose of ferrous sulfate.

PHOTOGRAPH 11 September 16, 2015 setting slurry pump.

PHOTOGRAPH 12 Piping between PVC liners.

BARREN POND REMOVAL
BEAL MTN MINE, MONTANA
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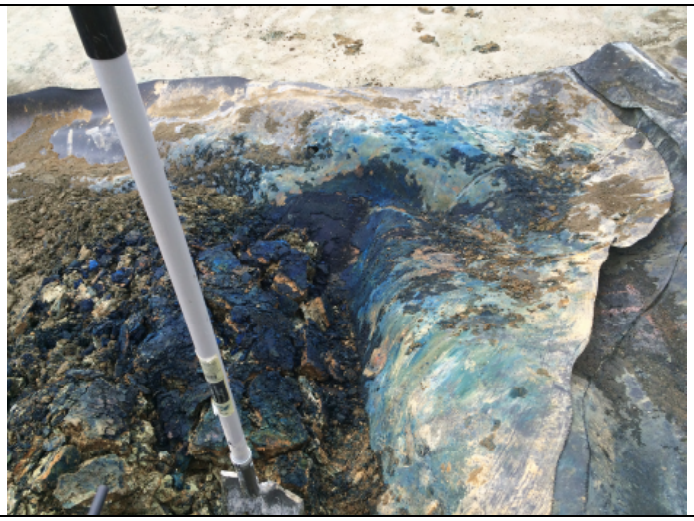
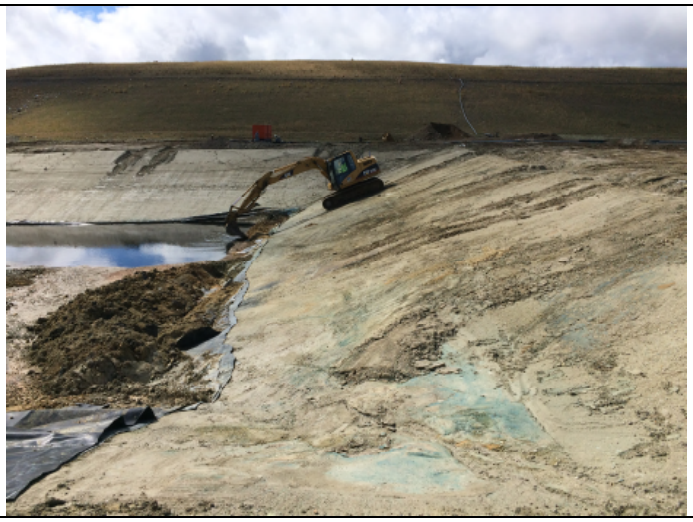
PHOTOGRAPH 13 Surficial staining of clay beneath PVC liner west wall.



PHOTOGRAPH 14 Biosolid staining on top of PVC liner.



PHOTOGRAPH 15 Surficial staining of clay NW corner.

PHOTOGRAPH 16 Applying ferrous sulfate and mixing with excavator.

PHOTOGRAPH 17 Thickening biosolids with sidewall clay.

PHOTOGRAPH 18 Removing thickened biosolids.

BARREN POND REMOVAL
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PHOTOGRAPH 19 Faulty seam in uppermost bottom PVC liner.

PHOTOGRAPH 20 September 25 removing upper sidewall clay.

PHOTOGRAPH 21 Staining beneath PVC liner SW corner.

PHOTOGRAPH 22 Surface staining with little penetration.

PHOTOGRAPH 23 Surface staining with up to 12-inches of penetration

PHOTOGRAPH 24 Staining beneath unstained surface.

BARREN POND REMOVAL
BEAL MTN MINE, MONTANA
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PHOTOGRAPH 25 Subsoil staining, with perched groundwater. Note geotextile fabric and lack of clay stain overlying.

PHOTOGRAPH 26 Subsoil staining of pond bottom after removal of clay and geotextile.

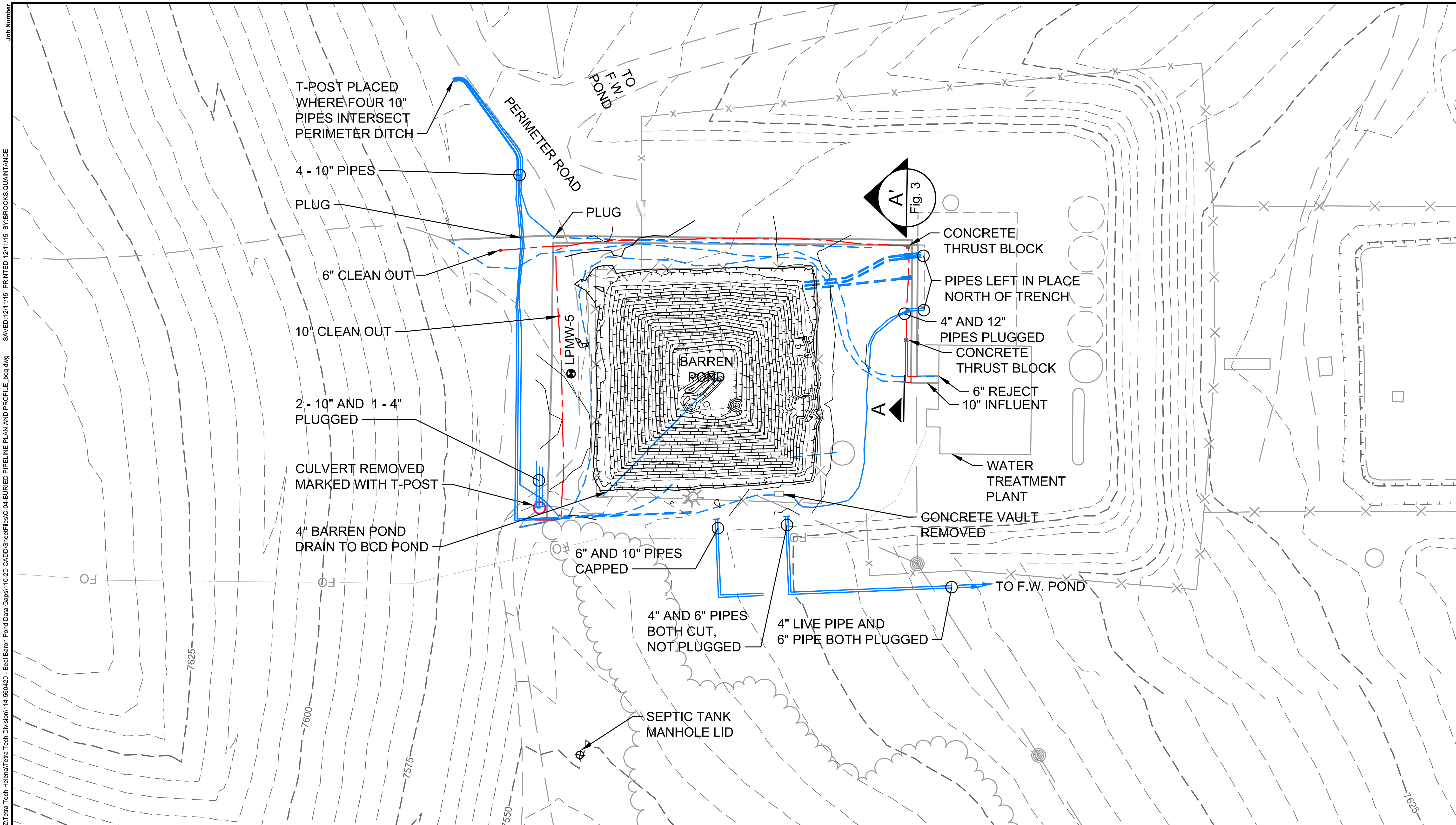
PHOTOGRAPH 27 Pond Underdrain found after searching west (left) to east (right). Note groundwater at or above drain elevation.

PHOTOGRAPH 28 Excavating pond underdrain. Note pipe was bent at 45 degrees upon excavation.

PHOTOGRAPH 29 Mating pond underdrain inlet.

PHOTOGRAPH 30 Lined drying pad/temporary repository center. Sidewall clay to right and bottom clay far right edge of photo.

Figures



Job Number

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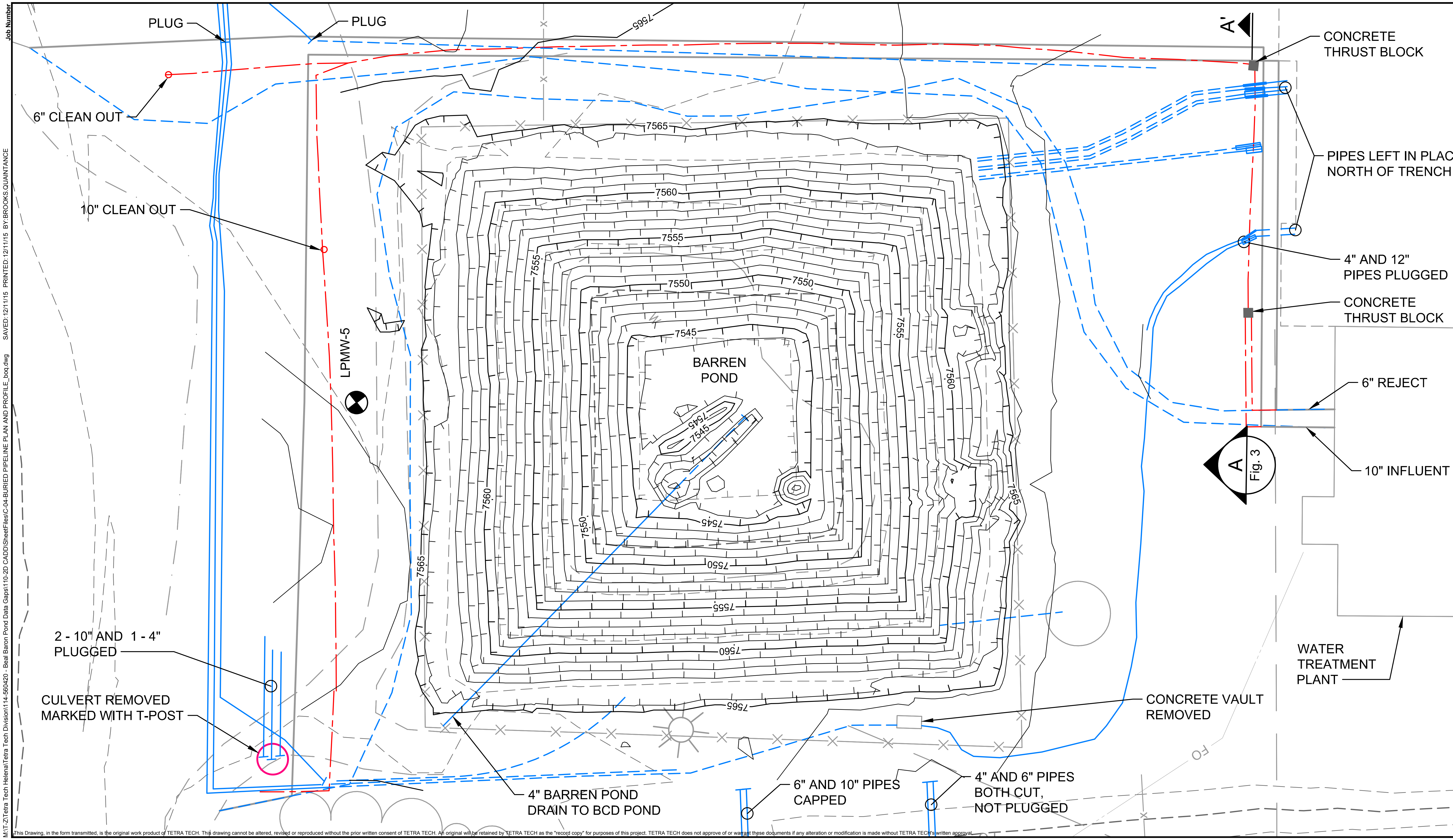
N

0 40' 80'
SCALE: 1" = 80'

Buried Pipe Left in Place
Buried Pipe Removed
Buried Pipe Cut and Plugged
Proposed Pipe for RO system
Surveyed Centerline of Trench As Built

Barren Pond Investigation
Buried Utilities
Beal Mountain Mine
Silver Bow County, Montana
FIGURE 1



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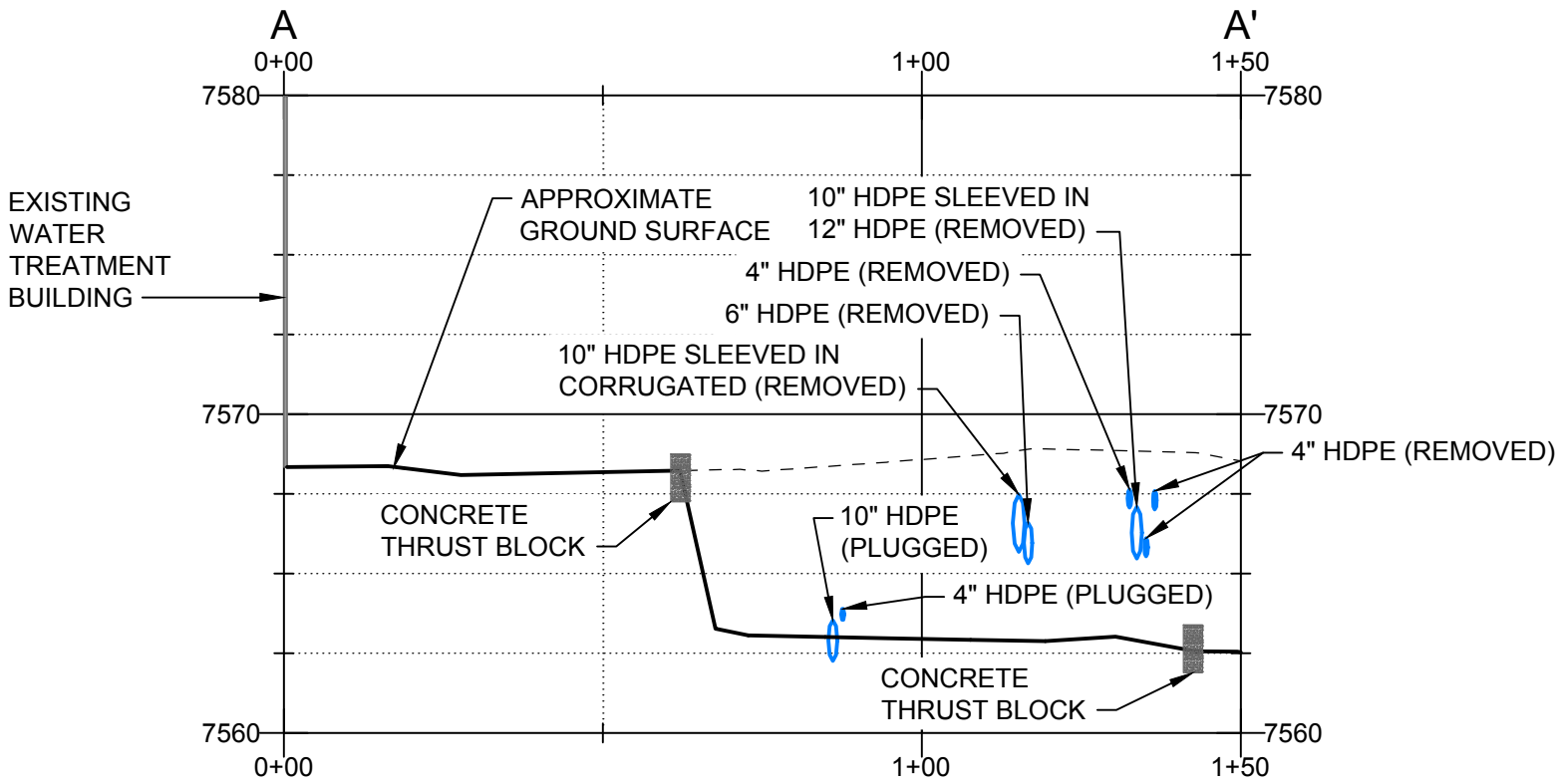
N

0 15' 30'
SCALE: 1" = 30'

- Buried Pipe Left in Place
- Buried Pipe Removed
- Buried Pipe Cut and Plugged
- Proposed Pipe for RO system
- Surveyed Centerline of Trench As Built

Barren Pond Investigation
Buried Utilities
Beal Mountain Mine
Silver Bow County, Montana
FIGURE 2



0 15' 30'
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Barren Pond Investigation
Buried Utilities Profile
Beal Mountain Mine
Silver Bow County, Montana
FIGURE 3

Field Notes

CONTENTS

PAGE	REFERENCE	DATE

6/22/15

J. Mams P. cloudy lt breeze from west 60°

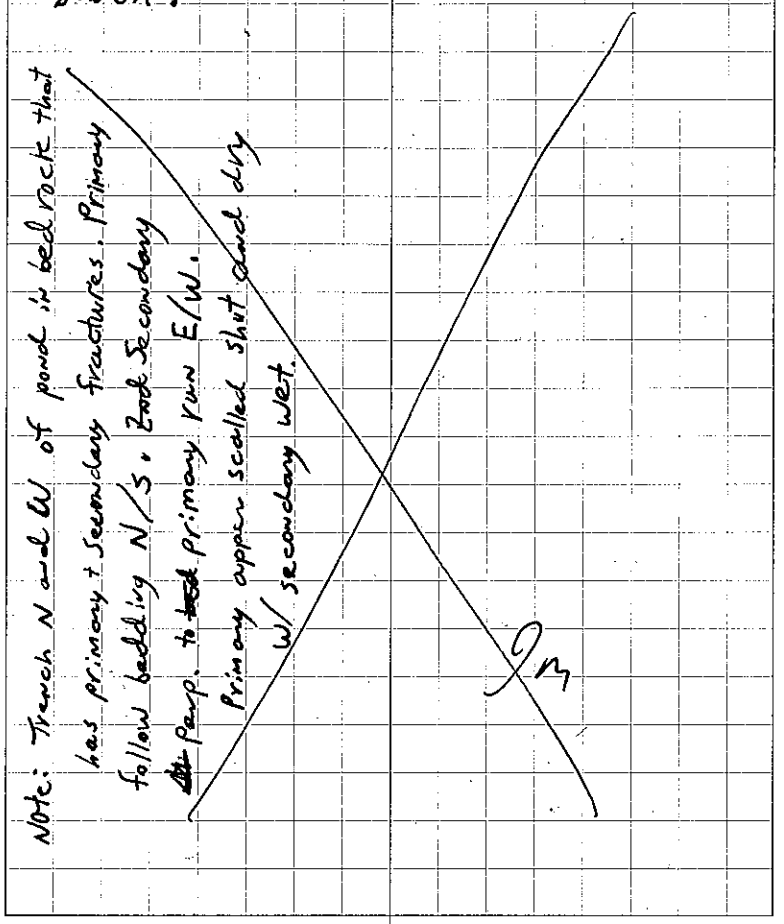
1215 onsite. checked sump-3A extension + pad work. Pad looks good. Casing needs to be cut off ~ 1.5-2 ft above grade and lid fabricated/installed

1220 checked in w/ Sonny Thornborrow and contractor (M+P). Dewatering going well - started last wednesday and shutting pump off at night. pond dewater pumped to ditch on N. side of track pad which takes it down toward BCD-A pond. Ditch is flowing strong until ~ 50 ft before the 2nd culvert. Water rapidly soaks into the ground in this area. The slope above the lower road appears to be stable w/ only a few

1430 Brown survey onsite
Discuss use of M+P Sond to trace pipes w/ Jeff (M+P) + Sonny

1530 found SW end of pipe that ran in trench along west side of pond. 10" pipe HDPE inside corrugated. At SW corner near new elbow pipe starts bending to west. Depth = ~3 ft bgs. bedded in ½" gravel. Inside of corrugated is wet. Pipe bottom appears to have been located below the wet line on trench walls. Took several photos. Note trench adow south side of pond is dry. The soils of trench wall appear native from SW corner E until ~ 10 ft W of foundation block encountered. From 10 ft W of foundation block east appears to be back fill.

Therefore, pond drain could not be more than 10 ft West of foundation block.
surveyors pictured up foundation block.



Rite in the Rain

spots showing wet. No running water on this slope.

Walked ~~the~~ trench w/ Sonny for RO Pipes ~~w~~ to look at other pipes encountered. Also noted wet (shallow) soils on trench walls along western leg of trench. Took photos of pipes + wet trench walls. Sonny indicates he has been adding infrastructure to mine design drawing and taking photos.

1330 R. English + M. Hatten on site for RO work

6" Steel well casing noted ~ 25 ft E of foundation block ~~along~~ south trench wall. Top of casing ~ 20 ft South of pond fence and ~ 3 ft bgs. Total depth ~ 23 ft bgs and dry

1630 Sonney off site I'M calibrating RO PH meter

1740 Leaving Site Randy and Mike Marking reject sections of pipe for RO ~~to~~ burial.

6/24/15 J. Mars P. cloudy calm 60°

0900 on site stop at borrow area to bump test MSA 5X for LEL, O_2, H_2S CO, and HCN. Unit bumptest OK for all. Unit calibrated last night. Called Rental company (Argus Hatco) to inform them of filter issues on MSA meter. They said OK to run unit today w/out filter in sample wand as long as not dusty or wet. They will overnight replacement filters. Note: Mst time reads 1100 (2 hrs fast) date OK

0930 Arrive at treatment plant. Sunny on site w/ contractor. Contractor Laying 10" pipe in trench along west side of pond.

1000 - 1200 completed continuous air mon. in trench while tracing pipes.

~1100 R. English on site

Rite in the Rain

1200 off Barren Pond job to help Randy English set RO Freshwater pond pump.

1545 Rtn to Treatment plant Sonney Not here. Excavator digging in SE corner of pon Since pipes suspected in this area went over to monitor Vabors

1640 Encountered (2) 10" HDPE in corrugated at SE corner of Pond. Western most goes into CMP. 2nd Pipe ~3 ft East by passes CMP. some water in trench appears to be coming from inside corregated ~~pipe~~ pipe of Eastern most line. Requested excavator to chase eastern most line a ways. suspect this line was the one tapped for RO influent

1730 finish chasing lines. Excavator trying To dig back far enough for existing influent line to down in trench

Pipe for RO is bedded in ½ Minus material which is wet / Saturated Bedding trench

1800 Locking equipment and bldg Leaving site

6/29/15 J. Mans P cloudy calm 75°

0915 Arrive on site. met 2 side dumps leaving on my way in. On site at request of Sonney to eval pipes encountered by crew on Friday. Sonny onsite. M+P on site prepping to test 10" and 6" lines Looked at lines encountered on Fri. in trench for 6". N. most line tapped first Had fluid which bubbled through tap hole (w/ ¼") ~ 6 inch fountain.

~~then~~ southern line tapped Next w/ ¼" bit sucked air (under vacuum). Shortly after the influent line from sump 1 at SE corner of pond began to flow water and burp. Middle line

Rite in the Rain

tapped next also sucked water but NO flow from Sump-1 Line ~~Lines~~ the two lines that were under vacuum were traced ~100ft either direction w/ sonde which was as far as could go. Both these lines has small amt of water in them.

the above description per Jeff McQuary and Sonny.

Surveyor will be here latter today to trace pipes.

Bump check pH/SC meter to check Acid sump again

	std	reads
pH	4.01	4.06
pH	7.01	7.08
SC	1413 @ 25°C	1431 @ 25.3°

Sump solution reads
pH 4.43 @ surface
pH 5.42 @ 2 ft depth

attempted to calibrate AIT Air 5X to use while tracing pipe w/ sonde. Bump test fail (H_2S). ~~attempt~~ multiple calibration attempts. H_2S still ~~fail~~ fails. Called Argus - Hatco to express concerns and lack of confidence in Meter. They will send overnight another AIT Air 5X w/ HCN and H_2S LEL O_2 CO to Helena by 3pm tomorrow.

1330 surveyor on site and setting up

1430 surveyor leaving site
- Traced 4" line (Line #1) near Plant
- 10" Line (Line #2) in corr, near Plant
- 10" line in corr } SW corner Pond
- 10" Line in corr
- 10" Line in corr
- 10" Line is corr - RO influent

and Trench extensions.

Kite in the Rain

Measure DTW in Sump 3A
DTW from top New casing extension
= 64.19 ft
Transducer pulled out and on grnd
coiled up and took back to HLN.

Sump-1 DTW = 63.68 top steel
Dwcn = 11.62 ft 16.80 volts

1515 LV site

Note: Not sonny as leaving site
he requested I be on site
all next week starting Monday
but no need for 2nd TT
at least not for barren pond work
Depending on O'Keefe schedule
may need TT person for soil
trans oversight.

7/6/15 J mans P cloudy calm 60°
0830 on site. Don May TT followed
Me on site. Don will be doing over
sight on Sump-3A clean out.
3 of M+P crew on site at plant
- Duane + 2 others. Jeff not here
Crane and welder on site for removal
of clarifier. Flat beds not here
yet. 2 M+P side dumps delivering
gravel and hauling concrete off.
Lined out Don on cleanout and looked
at discharge piping. Pipe needs to
be pulled into position + reassembled

1000 Jeff McQuery on site. Plan is
to run 2 crews 1 at pond to
dewater/remove upper liner and
1 to build drying pad.
Jeff indicates the found a buried
well while preping drying pad.
Looks to be a 6" steel casing
buried ~ 1-2 ft bgs. w/ 4" PVC
casing ~ 4 ft bgs. submersible
pump/wiring/drop pipe/ pitless

Rite in the Rain

still in well. Peter Warner (USFS) on site discuss w/ him. will cover over w/ steel plate and abandon latter to facilitate ~~per~~ dry pad construction.

1030 finish calibrating MSA meter held safety meeting w/ Jeff/ Lupe and Peter. ~~Excavator~~ Plan to move some pipes near pond rim then dis sump for dewater then set pump then begin remove exposed liner material.

1045 Excavator blew hydraulic line will be down for several hrs.

1100 O'Keefe on site. Held safety brief w/ O'Keef Don + Peter went on top of leach pad w/ Don + Peter to prep pipe while O'Keefe sets up.

1345 Jeff LV site to Pickup hose

1 crew working on repository pad prep.

1500 O'Keefe + Don off site sump clean out notes in other field book

1600 Excavator still down w/ broken hose. Jeff says they will not be digging tonight. I will check out w/ Peter and head to town.

7/7/15 gm

~~7/8/15~~ J. mans clear calm 60°

0810 on site M+P crew follow me in. Crane crew on site already. calibrate meter. spoke w/ crane + trucking crew (Matt) MCC trucks to inform them of potential vapor hazards from pond excavation and air horn notification. They agree to vacate to forman

shop pad if needed.

0830 Don May onsite

0900 begin cutting liner at top SW corner of pond and excavate liner toe trench here as well. Luke + Drake cutting liners into pieces ~ 12 ft W x 50 ft long and Rolling. When excavator picks Roll they wrap w/ duct tape to keep as role. Liner is double thickness Tripple thick in some areas

0930 Peter Werner onsite w/ many Bath Mats

0955 meter reads

O_2	20.8	H_2S	0
LEL	0	HCN	0.0
CO	0		

1000 started scraping Slurf in barren Pond. meter Reads HCN ~ 1.5 - 3.5 a couple deep scoops and HCN jumps to 10.5 - 12 ppm for ~~up to~~ 30 sec to 1 min. While working in black material generally HCN is above 4.0 ppm Pulled out of pond to reeval. operator and I notice slight headache. Check meter alarm limits

HCN

4.5 Low

10.0 High

Calibrate second Alt air 5X to use in equip cab since equip working upwind. Will attempt additional work and compare readings.

note: my meter clock is 1 hr 11 min fast compared to local time

1100 going back in hole to check equip readings and effect of wind

1110 operator indicates he is getting 10 - 11.5 after digging pulling out. I got 0.5 - 2 ppm down wind.

Pull out to reeval.

Rite in the Rain

Made calls to L. Caulfield + K. Miller (TT) to notify of CN conc, and to call for expertise on TT for options. They will let me know when have something

1300 Light rain. Will stand guard on liner cut crew since getting slippery when wet. Will stand by w/ rope.

1345 thunder storm, wind + rain cut liner blowing around. Will break till storm passes.

1500 Mary Beth + Peter Wanner off site. They issued M+P a partial stop work order for removal of bio solids. They will continue w/ liner removal, hauling concrete and drying pad prep.

1545 Don May off site. Was able to clean sump to 80 ft below toc. down hole tools ends show

Metal to metal contact. See Don's Notes. still need to set pump. and start transfer.

1630 leaving site. M+P still rolling liner and cleaning out liner for in trench.

7 jm

9/15 J Mans clear calm 60° lt breeze from East.

0830 on site. follow M+P onsite. 2 dump trucks, 1 side dump plus crew rig. side dump brought load of sand will haul concrete return. Both dumps brought sand also I am onsite since WSEs could not be and I was asked by Mary Beth to cover oversight while also here to oversee pump set in sump-3A.

1000 Jeff moving dirt out of way w/ loader to install saddle taps w/ pressure gauges on 3 lines at SW corner of Barrer Pond.

Rite in the Rain

1015 Done w/ loader now using small excavator.

installing tap saddles + press. gauges on 3 line.
- fused RO reject line
- continued hauling sand in and concrete / steel out ~~took 1 load of~~ from

collected (2) 5 gal buckets of Biosolid material in case need for testing.

1645 M+P off site
~~took~~ water truck
Dozer, loader, 2 excavators remain on site.
M+P will return tomorrow and get rest of equip and possibly haul rebar/steel and 1 load of liner material.

7/10/15 J. Mans

Appx. bulk density of sampled Biosolid material

Bucket #1 ~~4gal~~
Vol = ~4 gal
weight = 50 lbs
Tear weight = 2.4 lbs

Bucket #2
Vol = ~4 gal
weight = 49.68 lbs
tear weight = 2.4 lbs

Avg weight of wet solids = 11.9 lbs / gal

Rite in the Rain

7/17/15 R. EADS, J. MAUS

1140 CALIBRATION + READING OF SEDIMENTS USING MSA ALTAIR 5X AND DRÄGER TUBES

1145 START PUMP LEAK TEST OF DRAGER PUMP SYSTEM (15 MIN)

1150 CALIBRATE ALTAIR 5X

1158 ALTAIR 5X CALIBRATION GOOD

1200 DRAGER PUMP TEST GOOD.

Buckets shaken before sample drill hole

Bucket #1

Drager Tubes:
- H_2S = >60 ppm exceed tube range
- SO_2 = >25 ppm exceed tube range
- NH_3 = 4 ppm
- HCN = ~28 ppm

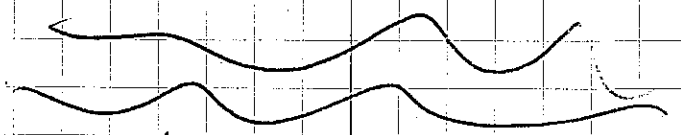
MSA meter:
- H_2S = 55 ppm alarm peak
- HCN = 41 ppm alarm peak

Bucket #2

Drager Tubes:
- H_2S = >60 ppm exceed tube range
- SO_2 = >25 ppm exceed tube range
- NH_3 = 5 ppm
- HCN = 35-38 ppm

MSA meter:
- H_2S = 91 ppm alarm peak
- HCN = >100 ppm alarm peak
- CO = 28 ppm

Took photos of dragers for record (used/unused pairs)



9/14/15 J. Maus overcast calm 50°F

0900 onsite, unlock, RO plant visit w/ Jeff McQuary + Brian They plan to begin mixing $FeSO_4$ late morning.

O'Keefe called to indicate they will be able to attempt clean out of Tw-1 today also.

Begin calibrating equip. for air monitoring

Calibrate Altair 5X meter ~~air~~ Fresh air + span. All values calibrated appropriately

0945 Sonny Thornborrow on site

1000 O'Keefe on site to attempt clean out

1305 O'Keefe offsite See site work field book for details.

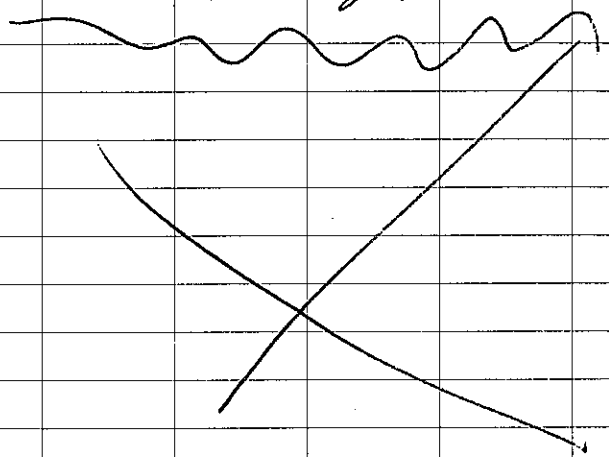
Rite in the Rain

1400 Begin air monitoring downwind of excavator pulling ramp out

1530 wind picking up heavy clouds, finish pulling ramp Begin applying $FeSO_4$

1600 added 1000 gal $FeSO_4$ solution will add another 500 gal then let drain back tank drain overnight into pond. Attempt slurry tomorrow

1615 Leaving site Sonny + M+P still working.



9/15/15 J. Mans overcast 10mph W 44°F

0910 Arrive onsite. M+P (Jeff, Brian, Trey?) onsite pulling liner material.

1100 calibrate Air mon. meter w/ span gas. All pass calibrate continue pulling liner.

1430 begin setting slurry pump

1815 leave site for Anaconda

9/16/15 J. Mans overcast calm 36°F

0830 onsite to continue air monitoring of sludge removal M+P onsite

0900 calibrate AltAir 5X meter

slurry test ⇒ slurry not flocculating and bags not able to filter suspension

1745 Leaving site after attempted several bucket tests for poly ratio.

Rite in the Rain

9/17/15 J. Maus overcast snow/rain
35°

0800 on site will try bucket tests w/ slurry water + polymer while waiting for M+P + SONNY.

- 1 gal slurry + 1 gal clean water + 1/3 cup poly water + 1/3 cup clean water ⇒ floc w/ too much poly (water is greasy)

- 1 gal slurry + 1 gal water + 3 Tblspn of poly water = floc in 20 sec.
  ↳ ≈ 0.25 cup of solid

- 1 gal slurry + 0.3 cup poly water ⇒ floc in <20 sec.

- note 1 gal slurry + 1 gal clean ⇒ 2 gal of diluted slurry should have about 3-4% solids

Several discussions w/ Jeff + Sonny on path forward. Recomend dig and haul w/ addition of $FeSO_4$ then use slurry for last bit and dose w/ polymer. Sonny will look at options and discuss w/ WSFS.

I clean up equipment and pump out waste rock Vault #4, which had ~ 2-2.5 ft of water

1330 Visit w/ Sonny + Jeff. New plan/approach is a hybrid of excavate solids and slurry. Will build a ramp or 2 into pond on N. side for highway dump access. Will skim ~1.5 ft of bio solids as possible, load and haul to repository. Spray $FeSO_4$ on lower layer and mix in w/ excavator. Let sit while skim another area. May or May not run slurry

1400 Sonny off site for paper work

Rite in the Rain

M+P begin ramp access and continue trailer pad prep.
Sonny asked me to stay and document what is done.

1650 done w/ ramp Jeff fueling beginning to snow/rain. Leaving site

9/18/15
0830 onsite Jeff + Brian + Drak onsite warming equip. Luke ??? followed me in w/ dump trk.
Calibrate gas meter
conduct air mon while attempt dig and haul
see construction oversight note for equipment details

continuous air mon resulted in
STEL=0.0 Peak = 30 ppm HCN w/ TWA = 0.0 ppm downwind of excavator
monitor in excavator peak = 4.5 ppm
TWA = 0.0 ppm HCN STEL = 0.0
1730 LV site

9/21/15 J. Mans clear 5 mph W wind calm to 50°F

0900 arrive onsite. loader working at drying pad. 320 c ex loading dry biosolids into dump. 312 ex trying to dewater sump at South side of pond.
calibrate M+P and Tetratech MSA air 5x meters.
One for cab of 320 c ex
one for me downwind of ex.
All span gasses and fresh air for all units pass calibration

conduct continuous air mon. downwind of ex.

1800 shut down for day

	320 ex mon	downwind mon
HCN	inst Peak = 1.5	38.5
HCN	STEL = 0.0	0.0
HCN	TWA = 0.0	0.0

1815 M+P off site
I went to start siphon on BCD pond
1900 off site

Rite in the Rain

9/22/15 J. Maws clear W. wind 5-10 mph 45°F

0820 onsite M+P (Jeff, Brian, Zuke) followed me in. Drake to Butte w/dump for bentonite.

0850 begin continuous air mon. loader extending east ramp. 320 ex loading truck on west ramp.

0830 calibrate air mon meters for 320 ex and downwind. Both meters pass for fresh air and all span gasses

1315-1345 Lunch break

1745 320 ex shutting down to fuel loader still stacking at repository

Air mon results

	Downwind	320 cab
HCN Peak	26.5	2.0
STEL	0.5	0.0
TWA	0.0	0.0

1830 Leaving site

9/23/15 J. Maws clear calm 45°

0815 arrive on site. M+P not here yet cows in the area.

0830 M+P onsite calibrating air mon meters Both meters pass for fresh air and all span gasses.

1100 Sonny onsite

1200 Calibrate 3rd meter (usds rental) to use in 312 ex.

1315-1400 Lunch break. 312 ex Lost track

1430 downwind meter reading 2.0 upwind 1st recalibration failed. Passed 2nd calibration effort. Returned to service but developed some problem over time. Taken out of service will use meter from 312 ex.

0830-1430 ppm
peak = 18.5 HCN
STEL = 1.5
TWA = 0.0

1745 shutting down.

	320 ex (0830-1745)	downwind (1430-1745)
Peak	1.5 ppm HCN	6.0 ppm HCN
STEL	0.0	0.0
TWA	0.0	0.0

Rite in the Rain

9/24/15 J. Mans Clear 50° slight wind variable direction

0830 calibrate all 3 meters.
- MSTs Last 3 digits 5918
- M+P Last 3 digits 5355
- TT Last 3 digits 5915

All 3 meters pass fresh air and all span gasses.

1320-1410 Lunch break. Air Mon meters in both excavators are showing alarms for CO and pump failures. Change filters → no effect. Units are warm to touch and were left in sun during break. Suspect heat issue. Since higher readings recorded downwind than in cab will place both ex meters in cool spot and continue operations w/ downwind meter.

~~1600~~ 1600 Both ex meters back in service.

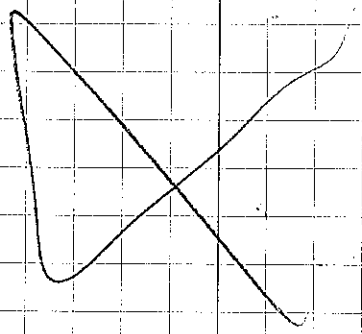
1800 Working SE corner of pond. Extreemly high ~~H2S~~ and consistent HCN readings despite 2 doses of $FeSO_4$.

1810 shutting down for the day / fueling + greasing.

Air Mon Results for Shift

	Downwind	320 ex	312 ex
peak	34.0	0.5	3.5
STEL	3.5	0.0	0.0
TWA	0.5	0.0	0.0

1840 leaving site encountered semi w/ bentonite. Followed him back in to site. Jeff waiting to unload. Jeff will follow him out in dump truck. Rest of M+P off site already



Rite in the Rain

9/25/15 J. Maus clear calm 55°

0800 Arrive onsite

830 M+P onsite (Drake
calibrate all 3 air MON meters
USFS # 5918 = 312 ex
M+P # 5355 = 320 ex
TT # 5915 = downwind
all 3 meters pass fresh air and
all span gasses.

0840 Jeff + Brian + Mat Andersen
Held safety brief w/ Mat

1130 Last load of solids out of pond

1145 Mary Beth + Sonny on site
Air MON Results
312 ex 320 ex downwind

Peak	2.0	1.5	11.5
STEL	0.0	0.0	0.0
TWA	0.0	0.0	0.0

1500 320 ex loading upper sidewall
clay. 2 dump trucks running.

1330 Mary Beth off site

1400 Kirk Miller + Mike Hatten on site

1510 Kirk + Mike off site

1715 Sonny off site

1815 leaving site

9/28/15 J. Maus clear calm 42°

0845 on site, M+P have equipment
warmed w/ first load of pond
side wall clay to repository

Will continue moving sidewall clay
to repository, ~~and~~ pulling liner ramps,
and begin pulling remaining liner
today 3 trucks running. 312 ex
Pulling clay around pond perimeter.

1300 Lunch break

1400 Sonny on site

1600 Sonny off site
Cutting liner, calibrate air MON.
meter and begin MON. of
Liner cutting.

1700 Finish Pulling side wall clay
320 ex Pulling liner

1750 M+P off site
I checked location known as
BCD-Barren - Location is flowing clear

1800 leave site

HCN AIR MON
Peak = 0.0
STEL = 0.0
TWA = 0.0

Rite in the Rain

9/29/15 J. Mans clear 45° Lt W wind

0815 on site picking up trash and dump bulk bucket samples in repository

0830 M+P on site. Calibrate Air Mon meter to mon. liner removal. Meter passes all span gasses 320 ex pulling liner. Drake cutting liner, Jeff + Mat stowing bentonite

0900 Lieke on site w/ side dump. Chuck Goodman on site for RO

0915 Randy English on site for RO. After pulled bottom liner for south third of pond, Noted clay very wet, several black spots that are not superficial. They penetrate the clay up to 6". Also some blue/green stain also present but this appears ~~Super~~ on surface only.

1215 finish pulling bottom liner except below ramp.

1300 begin loading bottom clay. Scraping stained clay first. Conduct air mon. Stained clay to repository. Clean clay to 2nd pond.
- SW corner stained all the way through clay.
- E sidewall center bottom to N. corner stained through clay
- W side wall where wall meets bottom stained through clay.
- water encountered immediately below clay E sidewall bottom center.

Note: Staining on sidewalls only went as high as biosolids within liners.

1400 Sonny on site

1515 Sonny off site. bottom of pond below geotextile appears to be 1-2" crushed rock uniform size.

1750 done loading for the day

1815 M+P off site

1830 Leave site.

Air mon Results
Peak = 1.5
STEL = 0.0
TWA = 0.0

Rite in the Rain.

9/30/15 J. Mans clear calm 45°

0800 onsite. Will collect BCD, BCD-Barren, Sump-1 samples for pre-dye dose of Barren Pond under drain

815 - BCD

0820 - BCD-Barren 1.5 gpm

0820 M+P onsite

0840 - Sump-1 RO Raw Influent

0845 - Manhole E of Barren pond appears septic tank. Not enough water. LPMW-5 DTW = 22.57

0850 - BCD-A sample for pre dye calibrate air MON meter. Passes fresh air and all span gasses. Begin air MON of clay removal while excavating bottom clay near West ramp Noted clay way ~2.5-3 ft thick (photos)

1010 Sonny onsite.

1020 Mary Beth onsite

1345 Mary Beth off site after discussing budget, covering temp repository, and final repository. Decided to leave temp repository open for winter.

Sampled black stained gravel under bottom clay. 5pt composit each

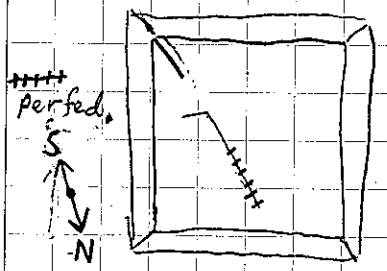
13 "Barren Pnd Bottom stained E"

1410 "Barren Pnd Bottom stained NW"

1415 Scrape black stain from bottom.

1530 finish pulling w. ramp begin explore for under drain

Found pipe ~10 ft further E of document descriptions. Pipe was broken befor we excavated it. Chased back North into pond. Identified first 20 ft is perfed as described w/ Rag stuck in end. Pipe is 4" HDPE. Buried ~ 18" below bottom of pond as documented.



HCN Air MON Result

Peak = 0.0

STEL = 0.0

TWA = 0.0

1710 Finish explore under drain. location known as BCD-Barren is running muddy w/ higher gpm as compared to this morning.

Rite in the Rain

1720 Sonny off site.
1800 follow M+P off site.

10/1/15 J. Mans 54° calm overcast light rain

0800 onsite catching up on paperwork + house keeping. Wait for M+P for exploration

0900 Jeff w/ M+P onsite warming equip.

0920 Brian w/ M+P onsite.

0945 begin following 3 lines from where RO Reject crosses near SW corner of pond to East w/ 320 ex

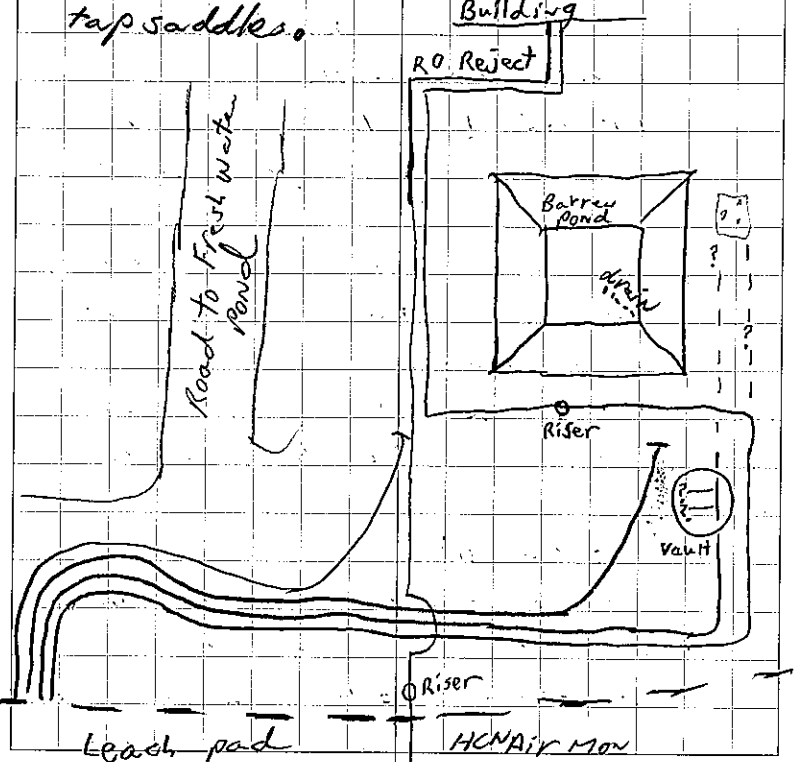
1010 312 ex following lines to west.

1015 Mary Beth + Peter onsite } USFS

1100 Sonny onsite

1315 M+P Lunch chased lines west in to leach pad and marked center of trench w/ fence post. (see sketch)

1415 Lunch over Mary Beth + Peter off site. Decision is to cut N. 2 lines at RO reject crossing and plug the west legs, and backfill west trench to fence post at heap leach. When pulling saddles off N. 2 lines, N. line began leaking water though no pressure. As if a valve were leaking somewhere. East end of the N. most line has been daylighted and was one of the lines Plugged last spring when installing new RO influent line. Reinstall tap saddles.



1545 leave site

10/7/15 J. Mans clear calm 50°
original entry to site wide field book
copied here by J. Mans on 10/12/15
due to subject.

0900 on site to collect samples of Barren pond stock piles. ~~and~~ Brian w/ MtP on site to backfill exploration trenches.

0940 collect 5 pt composite of East half of clay pile on upper fuel pad Barren Pond Bottom Clay labeled as
BP-BC-1 = (4) 4oz soil jars
(1) 5gal bucket

1010 5 pt composite of west half of clay pile on upper fuel pad Barren Pond Bottom Clay labeled as
BP-BC-2 = (4) 4oz soil jars
(1) 5gal bucket

1050 5 pt composite of N. half of clay pile between temp repository and pad cut slope Labeled as
BP-SC-1 = (4) 4oz soil jars
(1) 5gal bucket
(Barren Pond Sidewall clay)

1140 5 pt composite of S. half of clay pile between repository and pad cut slope labeled as
BP-SC-2 = (4) 4oz soil jars
(1) 5gal bucket
(Barren Pond sidewall clay)

Samples BP-BC-1, BP-BC-2
BP-SC-1, BP-SC-2
were all random point samples from 0-2 ft depth. All material was a gray clay w/~20% gravel, moist. No odor.

1210 Sample E edge of temp. repository as 5 pt composite labeled as
BP-BS-1 = (4) 4oz soil jars
(1) 5 gal bucket

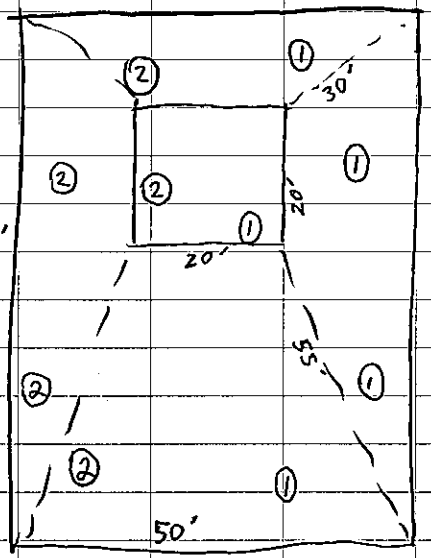
1315 5 pt composite of N. edge of temp repos. labeled as BP-BS-2 = same as above

1350 5pt composite sample of W. edge of temp repository labeled as
BP-BS-3 = same as above.

Rite in the Rain

BP-BS-1, -2, -3 were all random 5pt composite samples sampled from 0-2' depth. All material was a black/grey fine grained gel-like material w/ ~2" crust but saturated underneath. strong sewage like odor

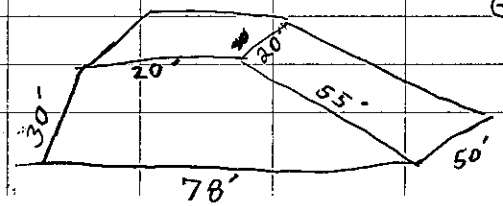
* Took photos and sketched sample locations



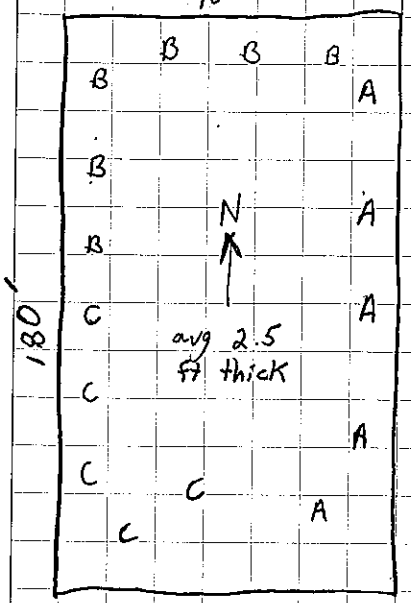
upper pad clay Pile "Bottom Clay"

est. ~ 1,400 yrds

① = BP-BC-1
② = BP-BC-2



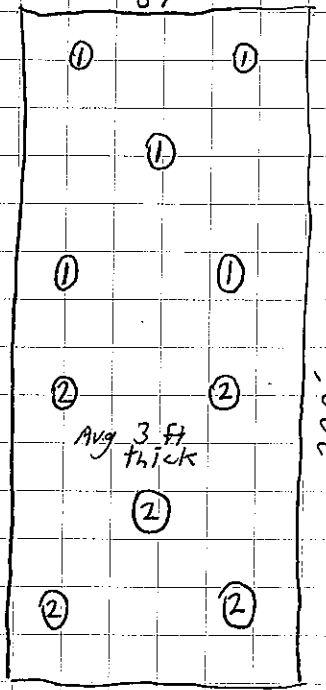
Temp Repository



A = BP-BS-1
B = BP-BS-2
C = BP-BS-3

est 1500 yrds

"Sidewall Clay"



① = BP-SC-1
② = BP-SC-2

est 900 yrds

1445 off site to deliver samples to lab

Rite in the Rain

TETRA TECH

Safety Excellence

Beal Mountain Mine Barren Pond AT German Gulch, Anaconda, Montana

Field Equipment Calibration Form

PROJECT SCOPE: The Forest Service intends to implement actions in accordance with the National Contingency Plan (NCP) and the Engineering Evaluation/Cost Analysis (EE/CA) to address existing and potential environmental impacts to groundwater associated with seepage from the Beal Barren Pond (BBP) facility. The EE/CA preferred alternative for the BBP includes ultimately removing the pond and reclaiming the area with positive drainage.

PROJECT NUMBER: 114-560420

Equipment Name/Model	Calibration Method and Standard Used	Name / Initials	Date	Time
MSA 5K	fresh air/pump/and span gas	JM	6/23/15	2000
Calibration Results	**Comments**			
all calibrate fine				

Equipment Name/Model	Calibration Method and Standard Used	Name / Initials	Date	Time
	bump test	JM	6/24/15	0900
Calibration Results	**Comments**			
all passed bump test OK				

Equipment Name/Model	Calibration Method and Standard Used	Name / Initials	Date	Time
Calibration Results	**Comments**			

TETRA TECH
Safety Excellence

Beal Mountain Mine Barren Pond AT German Gulch, Anaconda, Montana

Toxic Gas and Total Organic Vapor Detector Readings

PROJECT SCOPE: The Forest Service intends to implement actions in accordance with the National Contingency Plan (NCP) and the Engineering Evaluation/Cost Analysis (EE/CA) to address existing and potential environmental impacts to groundwater associated with seepage from the Beal Barren Pond (BBP) facility. The EE/CA preferred alternative for the BBP includes ultimately removing the pond and reclaiming the area with positive drainage.

PROJECT NUMBER: 114-560420

Readings Taken By:	Wind Speed and Direction:	Date:	Temp (F)	rH (%)
Maus	calm west	6/24/15	70°	
Instrument(s) Used	MSA 5X Altair			

Time	Location and Activity Description	Parameter	Units	Reading
1000 - 1200	continuous monitoring	HCN	ppm	0
	in trench while tracing	Oxygen	%	20.8
	pipes encountered.	LEL	%	0
		CO	ppm	0
		H2S	ppm	0-1

Time	Location and Activity Description	Parameter	Units	Reading
		HCN	ppm	
		Oxygen	%	
		LEL	%	
		CO	ppm	
		H2S	ppm	

Time	Location and Activity Description	Parameter	Units	Reading
		HCN	ppm	
		Oxygen	%	
		LEL	%	
		CO	ppm	
		H2S	ppm	

Time	Location and Activity Description	Parameter	Units	Reading
		HCN	ppm	
		Oxygen	%	
		LEL	%	
		CO	ppm	
		H2S	ppm	

TETRA TECH

Safety Excellence

Beal Mountain Mine Barren Pond AT German Gulch, Anaconda, Montana

Toxic Gas and Total Organic Vapor Detector Readings

PROJECT SCOPE: The Forest Service intends to implement actions in accordance with the National Contingency Plan (NCP) and the Engineering Evaluation/Cost Analysis (EE/CA) to address existing and potential environmental impacts to groundwater associated with seepage from the Beal Barren Pond (BBP) facility. The EE/CA preferred alternative for the BBP includes ultimately removing the pond and reclaiming the area with positive drainage.

PROJECT NUMBER: 114-560420

Readings Taken By:	Wind Speed and Direction:	Date:	Temp (F)	rH (%)
J. Mans	~2 MPH SE	9/14/15	50	?
Instrument(s) Used	AltAir 5X			

Time	Location and Activity Description	Parameter	Units	Reading
0930	calibrate unit	HCN	ppm	10
	w/ span gas	Oxygen	%	15
		LEL	%	29
	Fresh air cal, also	CO	ppm	60
	all values calibrate	H2S	ppm	20
	appropriately			
Time	**Location and Activity Description**	**Parameter**	**Units**	**Reading**
1430	NE corner of pond	HCN	ppm	0
	Removing ramp	Oxygen	%	20.8
		LEL	%	0
		CO	ppm	1-2
		H2S	ppm	0-1
Time	**Location and Activity Description**	**Parameter**	**Units**	**Reading**
		HCN	ppm	
		Oxygen	%	
		LEL	%	
		CO	ppm	
		H2S	ppm	
Time	**Location and Activity Description**	**Parameter**	**Units**	**Reading**
		HCN	ppm	
		Oxygen	%	
		LEL	%	
		CO	ppm	
		H2S	ppm	

TETRA TECH

Safety Excellence

Beal Mountain Mine Barren Pond AT German Gulch, Anaconda, Montana

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PROJECT NUMBER: 114-560420

Readings Taken By:	Wind Speed and Direction:	Date:	Temp (F)	rH (%)
J. Mann	W ~ 4 – 15 mph	9-15-15	45	
Instrument(s) Used	AllAir 5X			

Time	Location and Activity Description	Parameter	Units	Reading
1100	calibrate	HCN	ppm	10
		Oxygen	%	15
		LEL	%	29
		CO	ppm	60
		H2S	ppm	20

Time	Location and Activity Description	Parameter	Units	Reading
Continuous	Liner removal and	HCN	ppm	0
1100 – 1800	slurry test run	Oxygen	%	20.8
		LEL	%	0
	stable readings	CO	ppm	0-1
	all day	H2S	ppm	0-1

Time	Location and Activity Description	Parameter	Units	Reading
		HCN	ppm	
		Oxygen	%	
		LEL	%	
		CO	ppm	
		H2S	ppm	

Time	Location and Activity Description	Parameter	Units	Reading
		HCN	ppm	
		Oxygen	%	
		LEL	%	
		CO	ppm	
		H2S	ppm	

TETRA TECH

Safety Excellence

Beal Mountain Mine Barren Pond AT German Gulch, Anaconda, Montana

Toxic Gas and Total Organic Vapor Detector Readings

PROJECT SCOPE: The Forest Service intends to implement actions in accordance with the National Contingency Plan (NCP) and the Engineering Evaluation/Cost Analysis (EE/CA) to address existing and potential environmental impacts to groundwater associated with seepage from the Beal Barren Pond (BBP) facility. The EE/CA preferred alternative for the BBP includes ultimately removing the pond and reclaiming the area with positive drainage.

PROJECT NUMBER: 114-560420

Readings Taken By:	Wind Speed and Direction:	Date:	Temp (F)	rH (%)
J. Maus	calm	9/16/15	36	
Instrument(s) Used				

Time	Location and Activity Description	Parameter	Units	Reading
0900	Calibrate by	HCN	ppm	10
	span cal.	Oxygen	%	15
	all pass.	LEL	%	29
		CO	ppm	60
		H2S	ppm	20
Time	**Location and Activity Description**	**Parameter**	**Units**	**Reading**
		HCN	ppm	
		Oxygen	%	
		LEL	%	
		CO	ppm	
		H2S	ppm	
Time	**Location and Activity Description**	**Parameter**	**Units**	**Reading**
		HCN	ppm	
		Oxygen	%	
		LEL	%	
		CO	ppm	
		H2S	ppm	
Time	**Location and Activity Description**	**Parameter**	**Units**	**Reading**
		HCN	ppm	
		Oxygen	%	
		LEL	%	
		CO	ppm	
		H2S	ppm	

TETRA TECH

Safety Excellence

Beal Mountain Mine Barren Pond AT German Gulch, Anaconda, Montana

Toxic Gas and Total Organic Vapor Detector Readings

PROJECT SCOPE: The Forest Service intends to implement actions in accordance with the National Contingency Plan (NCP) and the Engineering Evaluation/Cost Analysis (EE/CA) to address existing and potential environmental impacts to groundwater associated with seepage from the Beal Barren Pond (BBP) facility. The EE/CA preferred alternative for the BBP includes ultimately removing the pond and reclaiming the area with positive drainage.

PROJECT NUMBER: 114-560420

Readings Taken By:	Wind Speed and Direction:	Date:	Temp (F)	rH (%)
J. Mans	Variable from Primarily SW 5 mph	9/18/15	40	
Instrument(s) Used	MSA AltAir 5X			

Time	Location and Activity Description	Parameter	Units	Reading
0830 Calibrate	calibrate Fresh air and	HCN	ppm	0
	Span gasses. All pass	Oxygen	%	15
		LEL	%	29
		CO	ppm	60
		H2S	ppm	20

Time	Location and Activity Description	Parameter	Units	Reading
0845	Walk Perimeter of	HCN	ppm	0
	Pond Biosolids	Oxygen	%	20.8
		LEL	%	0
		CO	ppm	0
		H2S	ppm	0

Time	Location and Activity Description	Parameter	Units	Peak Reading
1100 - 1700	continuous Mon downwind	Peak HCN	ppm	30
	of excavator	Oxygen	%	20.8
		LEL	%	0
	occasional instant peaks of	CO	ppm	13
	10 ppm HCN then dissipate	H2S	ppm	8
	rapidly HCN commonly <1			

Time	Location and Activity Description	TWA Parameter	Units	Peak Reading
1100 - 1700	Air Mon. in cab of 320 ex	HCN	ppm	4.5 Peak
		Oxygen	%	
		LEL	%	
		CO	ppm	
		H2S	ppm	

TWA	STEL
0.0	0.0
0	0
0	0

TWA	STEL
0.0	0.0

TETRA TECH

Safety Excellence

Beal Mountain Mine Barren Pond AT German Gulch, Anaconda, Montana

Toxic Gas and Total Organic Vapor Detector Readings

PROJECT SCOPE: The Forest Service intends to implement actions in accordance with the National Contingency Plan (NCP) and the Engineering Evaluation/Cost Analysis (EE/CA) to address existing and potential environmental impacts to groundwater associated with seepage from the Beal Barren Pond (BBP) facility. The EE/CA preferred alternative for the BBP includes ultimately removing the pond and reclaiming the area with positive drainage.

PROJECT NUMBER: 114-560420

Readings Taken By:	Wind Speed and Direction:	Date:	Temp (F)	rH (%)
J Mars	W 0-5 mph	9/21/15	50	
Instrument(s) Used	MSA Altair 5X			

Time	Location and Activity Description	Parameter	Units	Reading
0900	Calibrate Meter	HCN	ppm	10
	Fresh air and all span	Oxygen	%	15
	gasses pass.	LEL	%	29
		CO	ppm	60
		H2S	ppm	20

Time	Location and Activity Description	Parameter	Units	Reading
		HCN	ppm	
		Oxygen	%	
		LEL	%	
		CO	ppm	
		H2S	ppm	

Time	Location and Activity Description	Parameter	Units	Reading
		HCN	ppm	
		Oxygen	%	
		LEL	%	
		CO	ppm	
		H2S	ppm	

Time	Location and Activity Description	Parameter	Units	Reading
		HCN	ppm	
		Oxygen	%	
		LEL	%	
		CO	ppm	
		H2S	ppm	

TETRA TECH

CLIENT USFS DATE 9/17 + 18/15

JOB TITLE Barren Pond Removal JOB NUMBER

SUBJECT BY J. Maus SHEET 1 of 2

9/17/15

1400 M+P Jeff + Drake
Jeff beginning to excavate ramp into Pond on N. Side using 320C excavator. Drake on bobcat Moving gravel etc for trailer pad.

1430 Drake on loader to Move clay from ramp to another area

1520 Drake heading off site w/ side dump loaded w/ liner.

1620 Jeff finish excavator Now using loader to smooth + trim ramp

1635 done w/loader

1650 Jeff fueling eQuip. I'm leaving site

9/18/15

0830 onsite Jeff Brian + Drake warming loader + Bobcat.
??? - followed Me in w/dump trk.
All four proceed to drying Pad W/loader + Bobcat to Roll unused bag and alter ramp for dump access.

0930 Sonny on site drying Pond prepped for loads
Running roller to smooth ramp. Gen

1000 held tailgate on issues chemistry air mon.
Beg in skimming solids w/ 320 c excavator + 1 dump trk

Truck count
~~HH~~ IIII

1045 start slurry pump
1140 Pull excavator due to High ca alarms consistant will apply FeSO4
1215 Applied FeSO4 Made a soupy mess but seems to have knocked down HCN. Adding clay from Beneath liner to thicken
1230 Break for lunch
1300 Begin operations again
1330 Pulled slurry pump. 312 excavator feeding clay to 320 excavator to thicken

TETRA TECH

CLIENT USFS DATE 9/18/15 cont.

JOB TITLE Beal Mtn Mine JOB NUMBER

SUBJECT Barren Pond Removal BY J. Maus SHEET 2 of 2

1500 Process of adding clay to thicken is slow and not working well, takes a lot of clay and still does not adsorb well.

will try adding fill material rock dirt etc. to bind. Loader back from repository to move fill material to pond.

will also try adding polymer to Fe SO4 50% to see if polymer will displace water.

will try a 10% poly water SOLN. 200 gal water 20 gal poly. mixed in Fe SO4 tanks

Loader back from repository to extend ramp. 320 ex is beginning 2nd ramp.

Dump trucks hauling material from 2nd ramp out of way

~~mixing~~ 312 ex used to mix 5 gal ÷ 200 gall on poly water → not successful as thickener

1645 now trying to mix road mix type material w/ 312 ex to thicken.
320 ex done w/ 2nd Ramp loader smoothing 2nd ramp.

1700 312 ex done trying to thicken

1710 all equipment shut down

1730 LV site

TETRA TECH

CLIENT USFS DATE 9/21/15

JOB TITLE Beal Mtn Mine JOB NUMBER 114-560420

SUBJECT Barren Pond Removal BY J. Mans SHEET 1 of 1

0900	Arrive onsite, loader working at repository 312 ex working to set dewatering sump at south edge of pond 320 ex loading One dump	
0930	Brief shut down 320 ex due to CN > 10 ppm downwind. Will add $FeSO_4$	Load count Biosolid & clay ||| ||| ||| ||| ||
0945	mixing $FeSO_4$ and clay sonny onsite	clay 11
1100	attempt of bucket tests for thickening w/ granular bentonite, cement, lime	
	3 gal biosolids w/ 5 cups each ~~bentonite~~ bentonite worked best.	
1300	Lunch break	
1345	Loader extending ramp @ NW corner. 312 ex + 2 laborers have gone to remove the slurry bag from repository	
1500	320 ex begin biosolid removal NE corner ramp. Adding extra clay to thicken	
	discharge temp repository sump water to leach pad run off ditch same as during dewatering phase	
	loader is ~~grading~~ attempting to strip clay from other areas of pond to ~~stockpile~~ Load 1st dump for thickening. 2nd dump hauled load of clay to repository	
1730	Shutting down this area starting to get elevated HCN readings again. Will apply $FeSO_4$ to NW corner and mix in.	
1740	Mixing clay in NW corner	
1800	Shut down for day 320 ex	down wind 38.5 0.0 0.0

HCN inst peak = 1.5
HCN STEL = 0.0
HCN TWA = 0.0

1815 M+D 1 dump truck to town for bentonite at end of day

TETRATECH

CLIENT USFS DATE 9/22/15

JOB TITLE Beal Mtn Mine JOB NUMBER 114-560420

SUBJECT Barren Pond Removal BY J. Mans SHEET 1 of 1

0820	clear calm 0-10 MPH variable direction on site M+P (Jeff, Brian, Luke Butte w/dump for Bentonite calibrate air mon Meters for Both meters pass for fresh air and	Follow M in, Drake to 320 ex + downwind. all span gasses
0850	loader extending East ramp.	320 ex Loading dump on West ramp.
1030	shutting down west ramp ex due to HCN Moving to E ramp loader extending W. ramp. Preping $FeSO_4$.	
1050	Drake here w/ bentonite	
1100	Sonny on site discuss Temp repository capacity. Only able to stack ~3 ft high due to consistency. Decision to fill in sump w/ biosolids, stack as high as possible. Take pond clay and line area E of repository w/ Berm against shop pad cut. Overflow of solids to be placed in 2nd cell since determined it is better out of the pond and easier to handle next year.	
1315	Lunch break	
1330	Sonny off site	
1400	Lunch over. Dosing $FeSO_4$) extending E+W ramps, 320 ex gathering clay	
1415	resume ex of biosolids	
1530	seam of top liner in NW corner bottom do not appear welded or were not welded properly since tore apart easily in N/S direction nice and straight. very wet between liners. Another E/W seam same way Move to E ramp to mix in $FeSO_4$. West Ramp Needs extending	
1640	adding bentonite. Material on E side of pond much wetter and looser than West side. Loader returned from repository to extend West ramp	
1700	320 ex moving to West ramp, loader extending east ramp, dosing w/ $FeSO_4$	
1745	320 ex Shutting down to fuel loader still stacking @ repository	
1830	Leaving Site	

	Downwind	Cab 320 ex
HCN Peak	26.5	2.0
STEL	0.5	0.0
TWA	0.0	0.0

Load count
~~HH~~ ~~HH~~ ~~HH~~ ~~HH~~
~~HH~~ ~~HH~~ 1

0 = light load

TETRA TECH

CLIENT USFS DATE 9/23/15

JOB NUMBER 114-560420

JOB TITLE Beal Mtn Mine

SUBJECT Barren Pnd Removal BY J. Maus SHEET 1 of 1

0815 on site. Clear calm 45° variable wind speed + direction. calibrate air mon meters. Both meters pass fresh air and all span gasses.

0830 M+P on site warming equip.
0845 320 ex moving Bentonite to E ramp to mix in. Had to spray additional FeSO4. Mixed entire super sack of granular bentonite

0930 load first truck west ramp. loader at repository stacking
0945 312 ex pushing solids off side liner to make it easier for 320ex. 312 ex feeding clay to 320 e
1030 Move back to east ramp.
loader up to build W ramp.
1100 Sonny on site
1130 312 ex mixing FeSO4 on west side
1200 calibrate 3rd air mon meter for cab of 312 ex. loader back to repository to stack
3rd meter (USFS rental) pass all span gasses.
1215 Move back to west ramp
1230 Loader extending east ramp
312 ex feeding pond clay to 320 ex and piling for 2nd repository cell

1315 Lunch break. 312 ex lost right track. will be down a while

1400 320 ex resume loading one truck. downwind meter reading a consistant 2.0 ppm HCN after lunch even upwind. suspect so will recalibrate and change filter.
peak = 18.5 HCN
STEL = 1.5 HCN
TWA = 0.0 HCN

1430 downwind meter failed first recalibration attempt. All pass 2nd attempt w/all span gasses. Return to service but same behavior. will use this unit since 312 ex down. Unit from 312 ex shows 0.0 upwind.
1500 move to E ramp. Loader loading clay in 2nd trk and ~~both~~ extending W. ramp

1645 Moving to west ramp
1745 Shutting down for day
1800 Leaving site
Mixed 2 500 gal tanks of FeSO4. used one today

	320 ex	downwind (1430-1745)
peak	1.5 ppm	6.0 ppm
STEL	0.0	0.0
TWA	0.0	0.0

load count	bio solids + clay
~~IIII~~ ~~IIII~~ ~~IIII~~	~~IIII~~
~~IIII~~ (I) ~~IIII~~	~~IIII~~

Clay
~~IIII~~

O light load

TETRA TECH

CLIENT USFS DATE 9/24/15

JOB TITLE Beal Mtn Mine JOB NUMBER 114-560420

SUBJECT Barren Pnd Removal BY J. Mauss SHEET 1 of 1

0815	Clear ~~cotton~~ 50° slight wind variable direction,					
0830	godwin Pumps followed Me on site to retrieve slurry system. calibrate all 3 meters. M+P on site all 3 meters pass Fresh air and all span gasses.					
0915	320 ex loading godwin,					
	begin loading first trk on W. ramp w/ 320 ex. Fixing track on 312 ex					
1000	Moving to E. ramp.					
1030	312 ex feeding clay to 320 ex loader extending W. ramp. CMP installed in 2011 or 2012 for dewatering did not penetrate liner. However both top and bottom liners were torn from ~ 2 ft N of CMP to ~ 8 ft N of CMP w/ lots of black beneath bottom liner. 312 ex then Moved to NW corner					
	to gather clay					
1100	312 ex mixing in $FeSO_4$ and clay W. ramp					
1150	320 ex moving to W. Ramp					
1200	Sonny on site					
1320 – 1410	Lunch break Air mon meters in both excavators are showing alarms for CO and pump block. changed filters no effect. units are warm to touch and were left in sun during break, Suspect heat issue. Since higher readings recorded downwind ~~and~~ than in cab. will place both ex meters in cool spot and continue operations using downwind meter.					
	320 ex moving to E Ramp					
1600	320 ex moving to W Ramp. 312 ex feeding pond clay and solids to 320 ex. Both meters for ex back in service					
1800	320 ex done on west ramp 312 ex Mixing $FeSO_4$ E ramp. SE corner extremely high in HCN even after 2 doses of $FeSO_4$					
1810	Shutting down for the day					
1840	Leaving Site					

Load count biosolids + clay
IIII IIII IIII IIII
IIII IIII IIII I

Air Mon Results

	Downwind	320 ex	312 ex
Peak	34.0	0.5	3.5
STEL	3.5	0.0	0.0
TWA	0.5	0.0	0.0

Load count pond clay
II

Overnight load

TETRA TECH

CLIENT USFS DATE 9/25/15

JOB TITLE Beal Mtn Mine JOB NUMBER 114-560420

SUBJECT Barren Pond Removal BY J. Mans SHEET 1 of 1

0800 on site clean calm 55°
0830 M+P (Drake) on site
0840 Rest of M+P on site (Jeff, Brian, Matt Andersen. held safety brief for new driver
0910 320ex mixing additional $FeSO_4$ from E ramp
Loader feeding pond clay

calibrate all 3 air mon meters. All pass Fresh air and all span gasses.

0930 loading 1st truck. will run 2 trucks for pond solids today. Loader gathering clay.

1130 last load of solids out of pond.
320ex beginning to load sidewall clay

1145 May Beth + Sonny onsite

Air Mon Meters

	312ex	320ex	Downwind
Peak	2.0	1.5	11.5
STEL	0.0	0.0	0.0
TWA	0.0	0.0	0.0

~~loa~~ 320ex pulling sidewall clay and loading 2 trucks
sidewall clay is 2ft thick on average

1300 Lunch break
1330 Lunch over - May Beth leaving site
1400 ~~Kirk Miller~~ + Mike Hatten on site
1510 Kirk + Mike off site
1515 Matthew ~~and Pete~~ off site

1715 Sonny off site
1730 Last truck of clay. 320ex cleaning up geotextile
Loader scraping up clay on E side
1745 fueling equipment
1815 Leaving site

Load count solids/pond clay
|||| |||| |||| ||||

Load count clay

contractor indicates 69 loads sonny may have missed during visitors

0 light load

TETRA TECH

CLIENT USES DATE 9/28/15

JOB TITLE Beal MTN Mine JOB NUMBER 114-560420

SUBJECT Barren Pond Removal BY J. Mans SHEET 1 of 1

0845	onsite. M+P have equipment warmed w/ first load of Pond Sidewall clay to repository. Clear calm 42° 3 trucks running. w/ 320 ex					
0920	312 ex	Moving side wall clay				
1025	312 ex	pulling E Ramp w/ 1 dump truck dirty ramp material going to repository. Clean ramp material stockpiled West of pond.				
1145	Loader stacking ramp material higher while 312 ex Loads next truck. Loader then to repository to stack clay Loads					
	Measured CMP from center of pond used for dewatering.					
	CMP was 8ft length w/ 2 ft above bio solids.					
	Road mix ramp material used for access to CMP in center of pond stacked West of New office trailer pad. Loads of this material included in "Ramp material" load counts.					
1300 - 1400	Lunch break.					
1400	Sonny onsite discussed what to do w/ pond bottom clay. Decided that remainder of upper sidewall clay to be placed on old fuel pad as a base "liner" course. Any thing black under the pvc liner will go to repository. Remaining lower sidewall clay will go to upper clay pad. Bottom clay will go to repository as will fit. The remainder of bottom clay will go to upper clay pad.					
1600	Sonny off site. Luke beginning to cut liner. I calibrate air mon meter and begin air mon of cutting liners.					
1700	meter passes all span gasses finish upper sidewall clay. Trucks done hauling 312 ex picking up geogrid. 320 ex begining to pull liner					
1750	M+P off site	I went to check flow to BCD Pond				
1800	Location know as BCD-Barren still flowing					
	leaving site					

88 Loads

Side wall clay load count

Biosolids from Ramp Removal

Ramp material Load count

TETRA TECH

CLIENT USFS DATE 9/29/15

JOB TITLE Barren Pond Removal JOB NUMBER

SUBJECT BY J. Maus SHEET 1 of 1

Clear calm 45°

0815 on site - Picking up trash and dump bulk Barren Pond bucket samples in repository

0830 M+P on site 4 crew (Mathew, Drake, Jeff, Brian) calibrate ~~field~~ Air Mon meter to mon. liner cutting. ~~st~~ Meter passes all span gasses. 320 ex pulling liner, Drake cutting liner Jeff + Mathew stowing Bentonite

0900 Luke onsite w/ side dump

Bottom clay very wet. several Black spots on south third of pond. (see photos). Black spots are <u>not</u> superficial. Some blue/green stain also but this appears superficial

0940 water truck running to wet road for dust suppression. Loader moving top soil back ~~a~~ to E side of former fuel pad.

1130 320 ex leaves pond 312 ex now in pond folding liner. 320 ex is loading side dump

1215 finish pulling liner except that below Ramp.

1230 Stop for lunch. While M+P on lunch I start siphon @ BGD-A.

1250 Side dump left site w/ load of liner

1300 begin loading bottom clay. ~~one ex~~ 312 ex scraping side walls till clay is not discolored and feeding 320 ex. 320 ex loading trucks. 2 trucks running. Conduct air monitoring

Discolored clay to go in repository. Clean clay goes on second pad located on former fuel pad.

- SW corner Stained all the way through clay
- E side wall center bottom to N. corner stained through clay
- W side wall where wall meets bottom stained all the way through clay.
- water encountered imedediately below clay E side wall bottom center

Note: staining on sidewalls only went as high as biosolids within liner

Loader stacking stained clay in repository

- N wall center bottom 3ft stained all the way throuh clay

1400 sonny on site

1515 sonny off site

1535 side dump back on site Now Running 3 trucks

bottom of pond below geotextile appears to be 1-2" crushed rock - uniform

1750 Done loading for the day

1815 M+P off site

Load count Clay to Repository

~~||||~~ ~~||||~~ ~~||||~~ ~~||||~~ ~~||||~~

~~||||~~ ~~||||~~ ~~||||~~ ~~||||~~

~~||||~~ ~~||||~~ ~~||||~~ ~~||||~~

||

Air Mon Results

Peak = 1.5

STEL = 0.0

M+P indicat 66 Load

TETRA TECH

CLIENT USFS   DATE 9/30/15

JOB TITLE Beal Mtn Mine   JOB NUMBER

SUBJECT Barren Pond Removal   BY J. Maus   SHEET 1 of 2

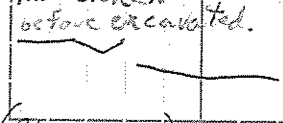
0800 – on site clear calm 45°
0815 – collect BCD pre dye
0820 collect BCD-Barren 1.5 gpm flow
MTP on site Brian, Jeff, Mathew
0840 collect sump-1 Raw influent at RO
0845 Man hole E of Barren Pond appears to be septic tank no flow after pumping out yesterday. Not enough water for pre-dye sample.
0850 collect BCD-A Pre dye sample.
Calibraite Air Mon. Meter, Passes fresh air and all span gasses.
Loader stacking yesterdays clay, Water truck wetting road.
0900 312 ex feeding clay in pond to 320 ex. 320 ex loading one truck.
While excavating bottom clay near ramp, noted bottom clay was ~2.5 ft thick
1010 Sonny onsite
1020 Mary Beth onsite
1030 2nd trk running
1345 Mary Beth off site
discussed final repository ideas and covering temp repository. Decision is to leave temp repository ~~open~~ uncovered for winter.
1300 – 1345 ~~Lunch~~ MTP Lunch Break
Sample black stained material beneath the pond bottom clay
13 Barren Pnd Bottom Stained E (5 pt composit)
1410 Barren Pnd Bottom Stained NW (5 pt composit)
1415 312 ex scraping black stain from pond bottom
320 ex pulling E ramp.
1530 finish pulling Ramp
320 ex begining to explore for underdrain
1630 encountered pipe at SE corner of pond. Pipe further E of where construction RPT describes. Pipe was broken before we excavated it. Chased back into pond.
First 20' is perfed w/Rag stuck in the end.

Load count
~~||||~~ ~~||||~~ ~~||||~~ ~~||||~~
~~||||~~ ~~||||~~ ~~||||~~ |

Ramp Material
~~||||~~ ~~||||~~ |||

Unable to complete pond sub soil sampling due to the Rocky material and lack of fines. Two samples collected were of Black stained coarse gravel and meet the intent of subsoil samples per Mary Beth 9/30/15

line broken before excavated.



(Plan View)

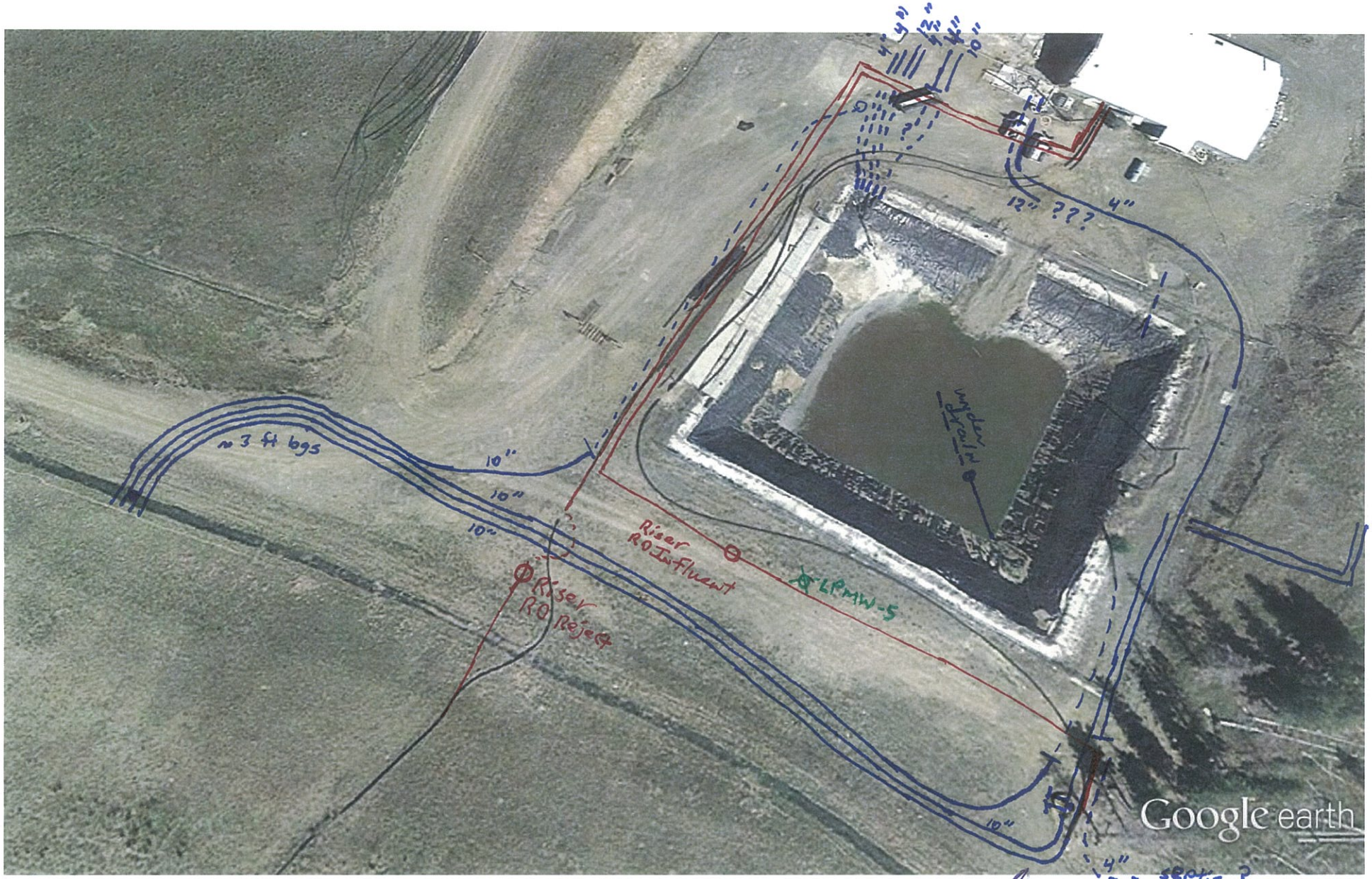
TETRA TECH

CLIENT USFS DATE 9/30/15

JOB TITLE Real Mtn Mine JOB NUMBER

SUBJECT Barren Pond Removal BY J. Mans SHEET 2 of 2

1710	320 ex finish exploritory for under drain. ~~BCD~~ location known as BCD - Barren on south side of leach pad is running muddy w/ much higher gpm compared to this morning.
	loader stowing extra liner and ~~fitter~~ slurry bag behind building under eve.
1720	Sonny off site fueling equipment etc.
1735	Mathew and one dump truck off site Jeff loading Rea gravel in one dump.
1800	2nd dump leaving site w/ Pea gravel. Jeff leaving site w/ pallet jack. I follow off site



Google earth

feet 300
meters 90

--- Pipe removed
—| Pipe cut and plugged
• Fence post middle of pipe corridor into Pad and where vault removed.
— Pipe installed for RO system as part of Pond investigation.

Lab Report

ANALYTICAL SUMMARY REPORT

November 04, 2015

Tetra Tech Inc
303 Irene St
Helena, MT 59601

Work Order: H15100035 Quote ID: H1076 - Beal Mountain Mine RO Analysis

Project Name: Beal Mtn Mine

Energy Laboratories Inc Helena MT received the following 3 samples for Tetra Tech Inc on 10/2/2015 for analysis.

Lab ID	Client Sample ID	Collect Date	Receive Date	Matrix	Test
H15100035-001	Barrow Pnd Bottom GW	09/30/15 14:15	10/02/15	Aqueous	Metals by ICP/ICPMS, Tot. Rec. Cyanide, Total Manual Distillation Cyanide, Free Total Cyanide Digestion Cyanide, Weak Acid Dissociable Metals Digestion by EPA 200.2
H15100035-002	Barrow Pnd Bottom Stain E	09/30/15 13:55	10/02/15	Soil	Cyanide, Free Total Cyanide Cyanide Distillation Cyanide, Weak Acid Dissociable
H15100035-003	Barrow Pnd Bottom Stain NW	09/30/15 14:10	10/02/15	Soil	Same As Above

The analyses presented in this report were performed by Energy Laboratories, Inc., 3161 E. Lyndale Ave., Helena, MT 59604, unless otherwise noted. Any exceptions or problems with the analyses are noted in the Laboratory Analytical Report, the QA/QC Summary Report, or the Case Narrative.

The results as reported relate only to the item(s) submitted for testing.

If you have any questions regarding these test results, please call.

Report Approved By:

CLIENT: Tetra Tech Inc
Project: Beal Mtn Mine
Work Order: H15100035

Revised Date: 11/04/15
Report Date: 10/13/15

CASE NARRATIVE

Tests associated with analyst identified as ELI-B were subcontracted to Energy Laboratories, 1120 S. 27th St., Billings, MT, EPA Number MT00005.

LABORATORY ANALYTICAL REPORT

Prepared by Helena, MT Branch

Client: Tetra Tech Inc
Project: Beal Mtn Mine
Lab ID: H15100035-001
Client Sample ID: Barrow Pnd Bottom GW

Revised Date: 11/04/15
Report Date: 10/13/15
Collection Date: 09/30/15 14:15
DateReceived: 10/02/15
Matrix: Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
INORGANICS							
Cyanide, Total	35.8	mg/L	D	0.4		E335.4	10/07/15 16:26 / eli-b38
Cyanide, Free	NA	mg/L		0.20		A4500-CN-F	10/08/15 13:02 / eli-b38
Cyanide, Weak Acid Dissociable	0.026	mg/L		0.005		Kelada-01	10/08/15 15:00 / eli-b38
- The Weak Acid Dissociable (WAD) Cyanide was analyzed, and was <0.2 mg/L, the detection limit for Free Cyanide. Free Cyanide was not analyzed.							
METALS, TOTAL RECOVERABLE							
Selenium	0.037	mg/L		0.001		E200.8	10/11/15 09:30 / dck

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
D - RL increased due to sample matrix.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

LABORATORY ANALYTICAL REPORT

Prepared by Helena, MT Branch

Client: Tetra Tech Inc
Project: Beal Mtn Mine
Lab ID: H15100035-002
Client Sample ID: Barrow Pnd Bottom Stain E

Revised Date: 11/04/15
Report Date: 10/13/15
Collection Date: 09/30/15 13:55
DateReceived: 10/02/15
Matrix: Soil

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
CYANIDE							
Cyanide, Free	NA	mg/kg		4		A4500-CN-Fm	10/12/15 16:16 / eli-b38
- The Weak Acid Dissociable (WAD) Cyanide was analyzed, and was <4 mg/kg, the detection limit for Free Cyanide. Free Cyanide was not analyzed.							
CYANIDE							
Cyanide, Weak Acid Dissociable	ND	mg/kg		0.5		D2036C-Mod	10/12/15 16:16 / eli-b38
Cyanide, Total	44	mg/kg	D	5		SW9012	10/07/15 14:21 / eli-b38

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
D - RL increased due to sample matrix.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

LABORATORY ANALYTICAL REPORT

Prepared by Helena, MT Branch

Client: Tetra Tech Inc
Project: Beal Mtn Mine
Lab ID: H15100035-003
Client Sample ID: Barrow Pnd Bottom Stain NW

Revised Date: 11/04/15
Report Date: 10/13/15
Collection Date: 09/30/15 14:10
DateReceived: 10/02/15
Matrix: Soil

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
CYANIDE							
Cyanide, Free	NA	mg/kg		4		A4500-CN-Fm	10/12/15 16:24 / eli-b38
- The Weak Acid Dissociable (WAD) Cyanide was analyzed, and was <4 mg/kg, the detection limit for Free Cyanide. Free Cyanide was not analyzed.							
CYANIDE							
Cyanide, Weak Acid Dissociable	ND	mg/kg		0.5		D2036C-Mod	10/12/15 16:24 / eli-b38
Cyanide, Total	ND	mg/kg		0.5		SW9012	10/07/15 14:30 / eli-b38

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: Tetra Tech Inc
Report Date: 10/13/15
Project: Beal Mtn Mine
Work Order: H15100035

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: **D2036C-Mod**										Batch: B_93848
Lab ID: **MB-93848**		Method Blank				Run: SUB-B250794				10/12/15 16:05
Cyanide, Weak Acid Dissociable		ND	mg/kg	0.04						
Lab ID: **LCS-93848**		Laboratory Control Sample				Run: SUB-B250794				10/12/15 16:07
Cyanide, Weak Acid Dissociable		4.07	mg/kg	0.50	84	60	140			
Lab ID: **H15100035-002A**		Sample Matrix Spike				Run: SUB-B250794				10/12/15 16:51
Cyanide, Weak Acid Dissociable		3.15	mg/kg	0.50	64	50	150			
Lab ID: **H15100035-002A**		Sample Matrix Spike Duplicate				Run: SUB-B250794				10/12/15 16:53
Cyanide, Weak Acid Dissociable		3.82	mg/kg	0.50	77	50	150	19	30	

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: Tetra Tech Inc
Report Date: 10/13/15
Project: Beal Mtn Mine
Work Order: H15100035

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: **E200.8**									Analytical Run: ICPMS204-B_151010B	
Lab ID: **ICV STD**		Initial Calibration Verification Standard							10/11/15 03:11	
Selenium		0.0589	mg/L	0.0050	98	90	110			
Lab ID: **ICSA**		Interference Check Sample A							10/11/15 03:15	
Selenium		-9.20E-05	mg/L	0.0050						
Lab ID: **ICSAB**		Interference Check Sample AB							10/11/15 03:18	
Selenium		0.0102	mg/L	0.0050	102	70	130			
Lab ID: **ICV STD**		Initial Calibration Verification Standard							10/11/15 13:51	
Selenium		0.0606	mg/L	0.0050	101	90	110			
Lab ID: **ICSA**		Interference Check Sample A							10/11/15 13:54	
Selenium		-8.10E-05	mg/L	0.0050						
Lab ID: **ICSAB**		Interference Check Sample AB							10/11/15 13:59	
Selenium		0.0102	mg/L	0.0050	102	70	130			
Method: **E200.8**									Batch: 30776	
Lab ID: **MB-30776**		Method Blank				Run: ICPMS204-B_151010B			10/11/15 06:21	
Selenium		ND	mg/L	0.0004						
Lab ID: **LCS-30776**		Laboratory Control Sample				Run: ICPMS204-B_151010B			10/11/15 06:24	
Selenium		0.491	mg/L	0.0010	98	85	115			
Lab ID: **H15100020-004BMS3**		Sample Matrix Spike				Run: ICPMS204-B_151010B			10/11/15 08:07	
Selenium		0.999	mg/L	0.0010	99	70	130			
Lab ID: **H15100020-004BMSD**		Sample Matrix Spike Duplicate				Run: ICPMS204-B_151010B			10/11/15 08:10	
Selenium		1.000	mg/L	0.0010	99	70	130	0.1	20	

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: Tetra Tech Inc
Report Date: 10/13/15
Project: Beal Mtn Mine
Work Order: H15100035

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: **E335.4**										Batch: B_93775
Lab ID: **LCS-93775**	Laboratory Control Sample					Run: SUB-B250557				10/07/15 13:35
Cyanide, Total		0.107	mg/L	0.0050	107	90	110			
Lab ID: **B15100242-037AMSD**	Sample Matrix Spike Duplicate					Run: SUB-B250557				10/07/15 13:46
Cyanide, Total		0.464	mg/L	0.0050	104	90	110	4.0	10	
Lab ID: **MB-93775**	Method Blank					Run: SUB-B250557				10/07/15 14:13
Cyanide, Total		ND	mg/L	0.001						
Lab ID: **B15100242-037AMS**	Sample Matrix Spike					Run: SUB-B250557				10/07/15 14:40
Cyanide, Total		0.446	mg/L	0.0050	94	90	110			

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: Tetra Tech Inc
Report Date: 10/13/15
Project: Beal Mtn Mine
Work Order: H15100035

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: Kelada-01									Analytical Run: SUB-B250649	
Lab ID: ICV		Initial Calibration Verification Standard							10/08/15 12:40	
Cyanide, Weak Acid Dissociable		0.0983	mg/L	0.0050	98	90	110			
Method: Kelada-01									Batch: B_R250649	
Lab ID: ICB		Method Blank				Run: SUB-B250649			10/08/15 12:43	
Cyanide, Weak Acid Dissociable		ND	mg/L	0.0007						
Lab ID: LFB		Laboratory Fortified Blank				Run: SUB-B250649			10/08/15 12:46	
Cyanide, Weak Acid Dissociable		0.108	mg/L	0.0050	108	90	110			
Lab ID: LCS1-ZnCN2		Laboratory Control Sample				Run: SUB-B250649			10/08/15 12:48	
Cyanide, Weak Acid Dissociable		0.0982	mg/L	0.0050	98	90	110			
Lab ID: B15100413-001FMS		Sample Matrix Spike				Run: SUB-B250649			10/08/15 13:13	
Cyanide, Weak Acid Dissociable		0.119	mg/L	0.0050	119	80	120			
Lab ID: B15100413-001FMSD		Sample Matrix Spike Duplicate				Run: SUB-B250649			10/08/15 13:15	
Cyanide, Weak Acid Dissociable		0.112	mg/L	0.0050	112	80	120	5.8	10	
Lab ID: B15100573-006DMS		Sample Matrix Spike				Run: SUB-B250649			10/08/15 14:36	
Cyanide, Weak Acid Dissociable		23.4	mg/L	0.10	94	80	120			
Lab ID: B15100573-006DMSD		Sample Matrix Spike Duplicate				Run: SUB-B250649			10/08/15 14:39	
Cyanide, Weak Acid Dissociable		23.1	mg/L	0.10	88	80	120	1.4	10	

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: Tetra Tech Inc
Report Date: 10/13/15
Project: Beal Mtn Mine
Work Order: H15100035

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: **SW9012**										Batch: B_93776
Lab ID: **MB-93776**	Method Blank					Run: SUB-B250557				10/07/15 13:49
Cyanide, Total		0.06	mg/kg	0.02						
Lab ID: **LCS-93776**	Laboratory Control Sample					Run: SUB-B250557				10/07/15 13:52
Cyanide, Total		5.34	mg/kg	0.50	107	60	140			
Lab ID: **H15100035-003A**	Sample Matrix Spike					Run: SUB-B250557				10/07/15 14:32
Cyanide, Total		2.98	mg/kg	0.50	51	50	150			
Lab ID: **H15100035-003A**	Sample Matrix Spike Duplicate					Run: SUB-B250557				10/07/15 14:35
Cyanide, Total		2.81	mg/kg	0.50	48	50	150	5.9	30	S

Qualifiers:

RL - Analyte reporting limit.
ND - Not detected at the reporting limit.
S - Spike recovery outside of advisory limits.

Work Order Receipt Checklist

Tetra Tech Inc

H15100035

Login completed by: Wanda Johnson
Date Received: 10/2/2015

Reviewed by: BL2000\rwilliams
Received by: bjs

Reviewed Date: 10/7/2015
Carrier name: Hand Del

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on all shipping container(s)/cooler(s)?	Yes ☐	No ☐	Not Present ☑
Custody seals intact on all sample bottles?	Yes ☐	No ☐	Not Present ☑
Chain of custody present?	Yes ☑	No ☐	
Chain of custody signed when relinquished and received?	Yes ☑	No ☐	
Chain of custody agrees with sample labels?	Yes ☐	No ☑	
Samples in proper container/bottle?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	
All samples received within holding time? (Exclude analyses that are considered field parameters such as pH, DO, Res Cl, Sulfite, Ferrous Iron, etc.)	Yes ☑	No ☐	
Temp Blank received in all shipping container(s)/cooler(s)?	Yes ☑	No ☐	Not Applicable ☐
Container/Temp Blank temperature:	2.1°C No Ice		
Water - VOA vials have zero headspace?	Yes ☐	No ☐	Not Applicable ☑
Water - pH acceptable upon receipt?	Yes ☑	No ☐	Not Applicable ☐

Standard Reporting Procedures:

Lab measurement of analytes considered field parameters that require analysis within 15 minutes of sampling such as pH, Dissolved Oxygen and Residual Chlorine, are qualified as being analyzed outside of recommended holding time.

Solid/soil samples are reported on a wet weight basis (as received) unless specifically indicated. If moisture corrected, data units are typically noted as –dry. For agricultural and mining soil parameters/characteristics, all samples are dried and ground prior to sample analysis.

Contact and Corrective Action Comments:

COC states "Barren Pdn Bottom GW", bottle states "Barren Pnd Bot. GW", used ID from COC. COC states for the soil jars "Barren Pnd Bottom Stain E" & "Barrow Pnd Bottom Stain NW", bottles state "Barren Pnd Bottom Stained East" and "Barrow Pnd Bottom Stained NW", used ID from COC. wj 10/2/15

Chain of Custody and Analytical Request Record

Page 1 of ____

PLEASE PRINT- Provide as much information as possible.

Company Name:	Project Name, PWS, Permit, Etc.	Sample Origin	EPA/State Compliance:
Tetra Tech Inc.	Beal Mtn Mine	State: MT	Yes ☐ No ☒

Report Mail Address:	Contact Name:	Phone/Fax:	Email:	Sampler: (Please Print)
303 Irene Street Helena, MT 59601	Jim Maus	443-5210	james.maus@tetratech.com	Jim Maus

Invoice Address:	Invoice Contact & Phone:	Purchase Order:	Quote/Bottle Order:
Same	Same		

Special Report/Formats – ELI must be notified prior to sample submittal for the following:

- ☐ DW
- ☐ GSA
- ☐ POTW/WWTP
- ☐ State: _____
- ☐ Other: _____
- ☐ A2LA
- ☐ EDD/EDT (Electronic Data) Format: _____
- ☐ LEVEL IV
- ☐ NELAC

Number of Containers
Sample Type: A Air W Water S Soils/Solids V Vegetation B Bioassay O Other

ANALYSIS REQUESTED

SAMPLE IDENTIFICATION (Name, Location, Interval, etc.)	Collection Date	Collection Time	MATRIX	Total Cyanide	WAD Cyanide	Free Cyanide	Total Recoverable Selenium						SEE ATTACHED	Normal Turnaround (TAT)
1 Barren Pnd Bottom GW	9/30/15	1415	2W	X	X	X	X							X
2 Barren Pnd Bottom stain E	9/30/15	1355	2S	X	X	X								X
3 Barren Pnd Bottom stain NW	9/30/15	1410	2S	X	X	X								X
4														
5														
6														
7														
8														
9														
10														

RUSH

Contact ELI prior to **RUSH** sample submittal for charges and scheduling – See Instruction Page

Comments:

Shipped by: hand del.
Cooler ID(s): Y
Receipt Temp 2.1 °C +0
On Ice: Yes (No)
Custody Seal Y N
Bottles/Coolers B C
Intact Y N
Signature Match Y N

LABORATORY USE ONLY #15100035

Custody Record MUST be Signed

Relinquished by (print):	Date/Time:	Signature:	Received by (print):	Date/Time:	Signature:
Jim Maus	10/2/15 1202	Jim Maus			
Relinquished by (print):	Date/Time:	Signature:	Received by (print):	Date/Time:	Signature:
Sample Disposal: Return to Client: _____ Lab Disposal: _____			Received by Laboratory: B. Seher	Date/Time: 10/2/15 12:02	Signature: Brandy Seher

In certain circumstances, samples submitted to Energy Laboratories, Inc. may be subcontracted to other certified laboratories in order to complete the analysis requested.
This serves as notice of this possibility. All sub-contract data will be clearly notated on your analytical report.
Visit our web site at www.energylab.com for additional information, downloadable fee schedule, forms, and links.